DOCUMENT RESUME

ED 093 132 EC 062 263

AUTHOR	Utrup, Robert G.
TITLE	Home Mechanics for the Visually Impaired.
INSTITUTION	Western Michigan Univ., Kalamazoo. School of Graduate Studies.
PUB DATE	Jan 74
NOTE	95p.
EDRS PRICE	MF-$0.75 HC-$4.20 PLUS POSTAGE
DESCRIPTORS	*Daily Living Skills; *Exceptional Child Education; Guidelines; Home Economics; *Industrial Arts; Lesson Plans; Maintenance; *Mechanical Skills; Repair; *Visually Handicapped

ABSTRACT

The manual is intended to be used in a course on home mechanics for the visually handicapped and is organized into 17 lessons. Lessons cover the following topics: adhesives (such as Elmer's glue), cleaning drains, faucet repairs, fire extinguishers, the flush tank, the fuse box, glazing, hammers, hand sanding, handsaws, hangers, nails and wood screws, painting, pliers and wrenches, screwdrivers, sharpening, and wiring a plug or lamp socket. The format for each lesson is divided into six areas: lesson (describing the goals such as predrilling for a woodscrew in the lesson on nails and woodscrews), materials (all tools and supplies needed to fulfill lesson objectives), tactual aids, questions and answers (to provide basic information), the procedure (step by step instructions for the lesson objectives), and safety. Also included are a list of seven references, suggestions for obtaining tools and other supplies, a list of recommended tools, and a list of 18 supplementary readings with brief annotations, availability in Braille or on tape, and reading levels. (DB)

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HOME MECHANICS FOR THE VISUALLY IMPAIRED

by

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Published By
The Graduate College
Western Michigan University
Kalamazoo, Michigan 49001
January, 1974

EC 062 263

ACKNOWLEDGEMENTS

I would like to thank the following people for their assistance: My wife, Sandy, for typing the final copy; William H. Poole for his advice and experience with many of the lessons; Richard Ruch who, as a technical writing instructor, offered many valuable ideas; Ruth Kaarlela and Donald Blasch of the Department of Blind Rehabilitation at Western Michigan University for proofreading the final copy; Ronald K. Mosher for allowing my wife and me access to the office equipment necessary for writing the final copy of the manual; and the students at M.R.C.B., for without them the writing of this manual would have been meaningless and impossible.

Robert G. Utrup

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INTRODUCTION

This home mechanics manual was developed because there was a felt need by the staff and the students at the Michigan Rehabilitation Center for the Blind for the development of such a course. In setting up a course of study it was imperative that there be some type of systematic and organized approach to the important areas included in the home mechanics curriculum. From the organization of the course came the manual which is now the basis for teaching the home mechanics lessons. The teaching of home mechanics in a very organized and systematic way has provided a multiplicity of benefits for our M.R.C.B. students.

With home mechanics, as with all courses in a rehabilitation program, confidence in one's own functioning is restored through the thrill of accomplishing each lesson. The knowledge that has been mastered in home mechanics can then be transferred to the home situation, where it can be put to excellent use. In the home the student finds that the knowledge gained through home mechanics complements his budget, and is a great convenience. The rebirth of the do-it-yourselfer in this country will not be another area where the visually handicapped person will have to be a nonparticipant.

The manual was designed to be purposefully self-limiting, in order to cover the most necessary tasks that one should learn. The design of the manual also aids the rehabilitation teacher that has minimal experience in the area of home mechanics. The lessons have

been rewritten after use in teaching, in order to exclude those parts that weighted it down, and include items that made it more valuable.

It is hoped that the information provided by this manual will provide more relevant and systematic knowledge to the field of rehabilitation teaching. The knowledge is systematic because the lessons are organized to make the teaching of home mechanics as understandable and efficient as possible.

The format for the lessons is divided into six areas. The six areas are:

I. Lesson
II. Materials
III. Tactual Aids
IV. Questions and Answers
V. Procedure
VI. Safety

Lesson - This section describes the goals of the lesson.

Materials - This section is simply a list of the items needed before one can carry out the lesson in the manner in which it was designed. The list includes all the tools and supplies needed to fulfill lesson objectives.

Tactual Aids - This section is used to suggest any tactual aids that might provide a better understanding of the lesson.

Questions and Answers - This section is designed with two purposes in mind. The first purpose is to act as a lecture without leaving out any important aspects of the lesson. The lecture aspect of the

Q and A section is especially valuable to the inexperienced teacher of home mechanics. Secondly, the Q and A section can provide a sampling of the student's background and experience with the particular area being studied.

Procedure - This section provides step by step instructions on how the objectives stated in the Lesson may be accomplished.

Safety - In this section the safety precautions brought out in the lesson are restated as a reminder to the student.

In a few lessons one or two of the six areas in the lesson have been omitted. Basically, though, the lessons involve all six areas.

Aside from the lessons, sections also included in the manual are: The Home Mechanics Shopper, this section recommends stores in which to purchase tools and supplies; The Home Mechanics Tool Cabinet, this section lists the collection of tools which would be valuable to have in the home workshop; and a list of Supplementary Readings in print, tape, and braille.

TEXT

Adhesives

Lesson

1. Have student learn to use an Elmer's Glue-All bottle.
2. Have student learn to use a tube of glue.

Materials

1. A bottle of Elmer's Glue-All.
2. A tube of an all purpose glue such as Sears' Silicone Sealant Adhesive or a tube of Dap Kwik Seal tub and tile caulk.
3. A sharp utility or paring knife.

Tactual Aids

It is beneficial to the student that larger bottles and tubes of glue be purchased so he can better acquaint himself with the line markings on the applicators.

Questions and Answers

1. What are some uses for glue around the home?
   a. Repairing furniture.
   b. Repairing broken glass.
   c. Repairing shoes.
   d. Hanging pictures, mirrors, towel racks and paneling.
   e. Laying floor, bathroom, and ceiling tile.
   f. Hanging wallpaper.
   g. Craft activities.

h. Children's playtime activities.

2. How should you choose a glue for use around the home.

The home mechanic should purchase a glue which has many household uses. To buy the best glue for each job around the home would be far too impractical. So, nowadays all-purpose glues can be purchased which will more than adequately fulfill household glueing tasks.

3. What types of tools are available for applying glues?

Brushes, trowels, and sticks are used for applying many heavier types of adhesives. However, the applicators found on glue containers are the most widely used within the home.

Procedure

1. Have student learn to use an Elmer's Glue-All bottle.

a. The Elmer's Glue-All bottle has an adjustable cap which regulates the flow of the glue. The adjustable cap is at the very top of the bottle. (For the student with partial sight the adjustable cap is orange). This conical shaped cap regulates the flow of glue when aligned with the lines on the round cap below. This round cap is stationary with raised lines which can easily be felt by the student.

b. To find the "off" position turn the adjustable cap clockwise until you are unable to turn it any longer. When the adjustable cap is in the off position the single line on the stationary cap will be directly below a notch in the base of the adjustable cap. It is important to start from the off position because the adjustable cap has two notches and this position shows the student which one to use as a guide for regulating the flow of the glue.

c. To find the "fine flow" position align the notch in the adjustable cap with the double line on the stationary cap by turning the adjustable cap counter clockwise.

d. To find the "medium flow" position align the notch in the adjustable cap with the triple line on the stationary cap by turning the adjustable cap counter clockwise.

e. To find the "full flow" position align the notch in the adjustable cap with the quadruple line on the stationary cap by turning the adjustable cap counter clockwise.

f. To remove the adjustable cap for cleaning continue to turn it counter clockwise from the full flow position and lift off.

g. To replace the adjustable cap push it down over the stationary cap until it "pops" and then turn it clockwise.

h. When using the Elmer's Glue-All bottle set the flow desired and turn the tip of the adjustable cap so it is resting on the object to be glued. With the finger tips and the thumb of the hand that holds the bottle press firmly in the center. This will force the glue from the bottle.

i. After use return the adjustable cap to the off position and store.

2. Have student learn to use a tube of glue.

a. Some glue tubes have a long plastic cap which is used as an applicator. This plastic cap is of a conical shape with raised lines which act as guides for cutting an opening in the end of the applicator to release the glue. There are usually three raised lines which indicate the following: a cut on the raised line nearest the tip means a fine flow of glue, a cut on the middle line means a medium flow of glue, and a cut on the line nearest the tube means a full flow of glue. To cut an opening in the plastic applicator, place the tube on a flat surface. Using a sharp knife, place the blade on the raised line duplicating the angle of the line. Slice through the plastic applicator with slow and steady strokes. To keep the glue from drying, place a common nail in the applicator to fill the opening.

Note: Sears' Silicone Sealant Adhesive and Dap Kwik Seal Tub and Tile Caulk are two good adhesives to have around the home which come in the type of tube described above.

b. Some glue tubes have a small cap that fits over the tip of the applicator. This cap protects the glue from drying out. To remove the cap turn it counter clockwise; conversely, to tighten the cap turn it clockwise. Glue tubes with this type of cap usually have a tip which is made of steel so an opening in the end has already been cut.

c. Place the tip of the applicator on the surface to be glued.

d. Starting at the end of the tube that is opposite the applicator, squeeze it between your thumb and index finger. Always squeeze on the end of the glue tube that is farthest from

the applicator to assure that the tube will be emptied properly. Apply glue generously making sure to cover the entire surface to be glued.

e. Most wood gluing jobs require clamping with C-clamps, vise, wood clamps, or pressure from heavy objects being placed on it.

f. When gluing furniture, apply a thin first coat of glue to both pieces to be joined. When the glue becomes tacky apply another coat and join the pieces and clamp. (4:16)

Note: Rubber bands, adhesive tape, rope, and heavy books are some materials found around the home which can be used to hold glued objects together. (1:153)

g. When gluing non-porous materials together, such as china, glue one piece at a time and let it dry until the total job is completed. This will keep pieces from slipping out of position under the weight of others. (4:15)

h. Many glues require 24 hours to be completely dry. Make sure your gluing job is completely dry before subjecting it to any strain.

i. Remove glue from hands as soon as possible because some glues dry on to stay. Glue on the fingers will often times dry faster than glue between objects because of the large amount of air exposure from the pores of the skin and from exposure to the air in the room.

Safety

1. Always have a clear understanding about what the glue can or cannot do, as well as a knowledge of any safety precautions that must be followed.

2. Some glues emit harmful vapors so they must be used around proper ventilation.

3. Make sure that the glue your children use is safe enough to eat. There are many good glues on the market which are especially made for use by children.

4. Some glues are flammable so should not be exposed to heat or fire.

Cleaning Drains

Lesson

1. Have the student use a plumber's friend on a sink drain.
2. Have the student use a plumber's snake on a sink drain.
3. Have the student clean the bath waste and overflow assembly.

Material

1. Plumber's friend.
2. Plumber's snake.
3. Bathroom area which includes:
   a. Bathroom sink.
   b. Bath tub with bath waste and overflow assembly.
4. Screwdriver - Phillips or standard depending on the type of screw found in the bath waste and overflow assembly.

Tactual Aids

1. Have the student tactually investigate the large end of the plumber's snake which breaks up the clog.
2. Take the student's index finger and trace the various trap shapes on the work bench.

Questions and Answers

1. What is meant by "trap" when referring to plumbing?

   A trap is a bend in the pipes which catches and holds water. Traps are found between the plumbing fixture and the sewer to prevent odors and dangerous sewer gases from entering the house.

2. What is a plumber's friend?

A plumber's friend is a rubber plunger used to unclog drains. It is held over the drain and the wooden handle attached to it is moved in an up and down motion, thus creating pressure which can free clogged drains. Some rubber plungers can be purchased which have a rubber cup adaptable to sinks and toilet bowls.

3. What is a plumber's snake?

A plumber's snake is a long coiled steel spring which is used to unclog drains. The plumber's snake comes in various lengths with an adjustable handle. Snakes are available which are enclosed within a metal casing for easier handling and use. The purpose of a snake is to bore itself through the clog to break it up. The snake is also equipped with a small hook on the end of the spring so that the clog might be hooked and brought back up.

4. How do you recover a lost article from a sink?

The first thing you must do after dropping something down the drain is to shut off the water immediately if it is running. The next step requires that the plug in the clean-out hole be removed. The plug is found underneath the trap, so consequently a pail should be used to catch the water and the lost item when the plug is removed. If the trap does not have a clean-out hole then the whole trap must be removed to recover the lost item.

Procedure

1. Have the student use a plumber's friend on a sink drain.

   a. Remove the stopper in the bottom of the sink if possible. (1:219)

   b. Plug the overflow hole with a rag to give the plunger more suction action. (1:219)

   c. Rub the bottom rim of the plunger with vaseline to create a better seal. (1:219)

   d. Place the plunger over the hole in the bottom of the sink. Run water over the plunger, this will also aid in creating a good seal.

   e. Work wooden handle up and down without lifting the rubber plunger off the bottom of the sink.

Note: I have found that many students cannot work with the plunger up and down with just the use of their arms. As a consequence it was

found that by placing the shoulder on top of the handle with the trunk bending and rising that this reduces the muscle strain involved. Care must be taken that while the bending is taking place that the student's head is not going to make contact with the wall or any objects hanging on the wall.

f. The clog has been loosened when the water runs out of the sink. Do not give up on the sink too soon--10 to 15 minutes with the plunger is a prerequisite before going to something else.

2. Have student use a plumber's snake on a sink drain (Drain Aid type).

a. Identify the parts of the Drain Aid. Start with the narrow end where the end of the plumber's snake is found. Trail up from that point until you find the thumb screw extending at a right angle from the shaft. Continuing up the shaft, go until your hands come in contact with a large handle which also extends from the shaft at a right angle. Just above the large handle is found a large round head which contains the snake. On top of the head is a small knob-like handle.

b. Remove the stopper in the bottom of the sink.

c. Loosen the thumb screw on the shaft ¼ turn at a time until you can pull the snake out of the shaft. Turning the thumb screw ¼ turn when loosening it will prevent the student from loosening the thumb screw too fast and dropping it down the drain.

d. Pull the snake out from the shaft and push it down the hole in the bottom of the sink as far as it will go.

e. Place the end of the shaft 5 to 6 inches from the drain hole and tighten the thumb screw.

f. Hold the handle on the shaft with one hand and turn the knob on the head clockwise with the other hand. This will feed the snake into the drain.

g. When the end of the shaft enters the opening in the drain, loosen the thumb screw and raise the shaft another 5 to 6 inches above the drain hole and repeat the process.

h. When enough snake has been fed into the drain to have unclogged the pipes, turn the knob handle on the head counter clockwise and pull it out.

i. Wipe off the snake and push it back into the shaft and tighten thumb screw.

3. Have student clean the bath waste and overflow assembly.

Note: The bath waste and overflow assembly is found at the head of the tub. This assembly raises and lowers the stopper, and also allows excess water in the tub to escape through an overflow hole. The part of the assembly which extends into the pipes collects dirt and hair, and consequently will make the drainage of the tub slow. To correct the slow draining the assembly has to be removed and cleaned.

a. Remove stopper by lifting out when in the up position. If the stopper cannot be removed then leave it in the closed position.

b. Locate the screws on the face of the assembly and remove them. The screws are usually found in the 3 and 9 o'clock positions.

c. Once the screws have been removed the assembly can be lifted out of the pipe. To remove, pull up and out on the assembly at the same time. Sometimes it is difficult to free the mechanism behind the assembly face. To free this portion of the assembly maneuver the face right and left until you can lift it out.

d. Pull the whole assembly out so it is free from the tub. Once the assembly has been freed you will find a long rod leading from the face of the assembly to a spring or round cylinder. It is on the spring or cylinder that dirt and hair will be found.

e. Clean the assembly.

f. Place assembly back in the tub, making sure the overflow hole is facing downward, and the handle that controls the stopper is in the closed position. Start both screws in the face of the assembly before tightening them down. If the stopper in the bottom of the tub fails to work then the assembly is probably binding at the spring and rod joint. To correct, simply remove and replace the assembly.

Safety

Using the plumber's friend and plumber's snake does not present a safety hazard. However, remind students that chemical drain cleaners are extremely hazardous. Before chemical drain cleaners are used the cautions and antidotes should be clearly understood.

Faucet Repair

Lesson

1. Have student change the washer on a compression faucet.
2. Have student fix a centrally controlled faucet. (Delta).

Materials

1. A compression faucet.
2. A centrally controlled faucet (Delta).
3. Crescent wrench (adjustable open end wrench).
4. Pipe wrench.
5. Standard blade screwdriver (probably 3/16").
6. Needle nose pliers.
7. New washer for compression faucet.
8. Replacement kit for the centrally controlled faucet. (Delta).

Questions and Answers

1. How does a compression faucet work?

   In a compression faucet there is a rubber washer over the water supply hole which controls the water flow. When the handle of the faucet is turned off this forces the rubber washer over the opening (seat). When the rubber wasner is lifted off the hole, when the water is turned on, the water is permitted to enter the spout.

2. What is the most common problem arising from the compression faucet?

   The most common problem is that the rubber washer used to shut off the flow of water becomes worn and will not "seat" properly. If the washer is dry and cracked it will not conform

to the metal seat to shut off the flow of water. When the washer is worn a leak develops at the end of the spout with the result of an annoying drip. The more the washer is worn the harder you with have to turn the faucet handle to shut off the water. With this process comes the possibility that the metal behind the washer will grind into the metal seat of the faucet. If this grinding process of metal on metal continues for any great length of time the seat will have to be reground or replaced.

3. How do you go about buying a new washer for a compression faucet?

To make the correct purchase you should take the worn washer to the plumbing supply store to assure that the right size is purchased. Do not try to buy a larger washer and cut it down to fit.

4. What is a centrally controlled faucet?

A centrally controlled faucet is a faucet with one handle for both the hot and cold water. When the handle is pulled forward the water is shut off; conversely, when the handle is pushed backward the water is on. A handle position right of center allows cold water to come from the spout; conversely, when the handle is to the left of center the hot water is allowed to come from the spout. Handle positions around the center will allow differing proportions of hot and cold water to enter the spout at the same time.

Procedure

1. Have student change the washer on a compression faucet.

   a. Place the stoppers in the drains so small parts will not be lost.

   b. Shut off the water supply by turning the valves underneath the sink clockwise. If there are no valves underneath the sink the main water supply valve usually found in the basement will have to be turned off.

   c. Remove the screw atop the faucet handle and remove handle. Some faucet handles have a small plastic cap which sets over the screw. To remove this cap to get at the screw, place your fingernail or a thin screwdriver blade underneath the edge of the plastic cap and lift off.

   d. With a crescent wrench remove the packing nut. The packing

nut is found where the stem enters the sink.

e. Now, remove the stem by turning the hexagon shaped part of the stem counter clockwise. The old washer is at one end of the stem.

f. Remove the screw from the center of the old washer.

g. Put new washer into place making sure that the rounded side of the washer is to the outside of the stem.

h. Replace screw.

i. Replace the stem by turning it clockwise into the faucet base. Tighten it down snugly with a wrench.

j. Tighten the packing nut over the stem by turning it clockwise.

k. Replace handles and turn to the "off" position.

Note: If the faucet handle is round then it can be replaced no matter what position the stem is in. Some handles, however, have a metal appendage which points to the left (hot) or right (cold) of the sink when in the "off" position. Before this type of handle is replaced the stem must be turned to the "off" position to assure that the handle will be situated properly.

l. Turn the valves underneath the sink counter clockwise to return the water supply to the faucet. Turn on the faucet to test for proper workmanship.

2. Have student fix a centrally controlled faucet (Delta).

Note: The following steps are directions for installing a replacement kit into a Delta Centrally Controlled Faucet.

a. Place the stoppers in the drain so small parts will not be lost.

b. Shut off the hot and cold water valves leading into the centrally controlled faucet. The shut off valves will either have round handles or straight metal handles. If the handles are round, a clockwise turn will stop the flow of water. If the handles are straight metal handles, a quarter turn making a right angle of the pipe and handle will shut off the water supply. The straight metal handles can only be turned one way and only so far, so there is no danger of turning it the wrong way. Turning the round handle counter clockwise and the straight metal handle parallel with the water pipe will return the water supply to the faucet.

c. Check to see if the water is off.

d. Find the small hex screw on the underside of the handle. Remove the hex screw with a hex wrench (allen wrench) by turning the screw counter clockwise. The hex wrench is provided in the replacement kit for the Delta Centrally Controlled Faucet.

e. Lift off the handle.

f. Unscrew and remove the cap assembly by turning it counter clockwise. The cap assembly is the dome shaped cap with a threaded base.

g. Find the metal stem protruding up from the faucet. Grasp the stem and pull up on it to remove the cam and ball assembly. A pair of pliers might be needed to pull up on the stem.

Note: Check the ball for signs of any roughness around the small holes. If there are signs of roughness the ball will need replacing.

h. Lift the two rubber seats and springs out of the hole left by the ball. The rubber seats will be protruding up from the bottom of the opening. Lift them out and then lift out the springs underneath them.

Note: If the faucet leaks at the end of the spout the rubber seats and springs need replacing.

i. Lift off the spout by moving the spout from side to side while lifting up on the spout body. This will expose the diverter and the two "O" rings. The "O" rings are found on the diverter about an inch apart running parallel with the top of the sink. The "O" rings are hard to feel, so take your time and concentrate on differentiating between the metal and the rubber.

j. Remove the "O" rings to check for wear. To remove the "O" rings, place a small screwdriver blade between them and the diverter. Expand the "O" ring by using the screwdriver as a lever and remove. A needlenose pliers can also be used to remove the "O" rings, just clamp the ring with the tip of the pliers and pull out and up. A worn "O" ring will have flat or torn areas.

Note: If the faucet leaks around the spout body this is an indication that the "O" rings need replacing.

k. Replace "O" rings by stretching them over the diverter. Make

sure not to use a sharp object to replace the "O" rings lest you damage them. Put the bottom "O" ring on first and then follow with the second.

l. Remove the diverter assembly which is found between the "O" rings and in the center of the diverter body. The diverter assembly feels like a small metal button. Pull out on the button and clean out the hole left by the assembly.

m. Replace the diverter assembly making sure to push the rubber collar around the button against the diverter.

n. Replace the spout body by placing it over the diverter. Press down gently on the spout body while moving the spout from side to side. The spout body squeaks as it goes over the "O" rings but this squeaking goes away after the water has been turned back on.

o. Replace the seat assembly. Place the two springs in the holes in the top of the diverter. Then place the new rubber assemblies over the springs, making sure to place the flat end up.

p. Replace ball and stem with the large hole in the ball facing towards the spout.

q. Replace the cam assembly by aligning the plastic tooth on the outside of the cam with the groove on the left side of the diverter.

r. Replace the cap assembly.

s. Replace the handle.

Safety

Make sure the water supply has been shut off before you begin work on the faucets.

Fire Extinguishers

Note: I would like to extend my thanks to Dwight King from the Kalamazoo Fire Prevention Bureau for the information to write this lesson.

Lesson

1. Have the student learn to use a dry chemical fire extinguisher.

2. Have the student learn to use a CO_2 fire extinguisher.

Materials

1. A 5 or 10 lb. dry chemical fire extinguisher (ABC).

2. A 5 or 10 lb. CO_2 fire extinguisher (BC).

3. Outside area for practice with the fire extinguishers.

Note: When it is impossible to go outside I have the students go through the motions without actually spraying the extinguishers. I supplement the lesson with a tape recording of the sounds that the extinguishers make. The recording is also a money saver because it is rather expensive to have two fire extinguishers recharged again and again.

Questions and Answers

1. What is meant by the fire triangle?

   The fire triangle refers to the three components necessary before a fire can take place. Those three components are:

   a. Fuel: wood, rubbish, grease, gas, or any flammable substance.

   b. Ignition: spark, fire, friction, static electricity, and any extreme heat.

   c. Oxygen.

2. What is meant by A, B. and C when referring to fires?

The three letters designate the type of fuel that is burning. The fuels are:

a. A - wood, rags, and general combustibles.

b. B - Grease, gas, and other burning liquids.

c. C - electrical.

3. What type of fire extinguisher is best for a visually handicapped person?

The best fire extinguisher for a visually handicapped person is an ABC type which can be used on any type of fire (except metal fires).

4. How long will a fire extinguishers spray last?

The duration of the fire extinguisher's spray depends on the size of the extinguisher. The smaller hand held extinguishers last anywhere from 20 seconds to 2 minutes.

5. What size fire extinguishers should you keep around the home and where should they be kept?

The home environment is considered by fire extinguisher manufacturers as a light hazard. To cover light fire hazards, $2\frac{1}{2}$, 5 or 10 lb. extinguishers should be kept in the kitchen, garage, and basement.

Procedure

1. Have student learn to use a dry chemical fire extinguisher (ABC).

a. Inform the student that he should stand from 4 to 5 feet from the fire.

b. Hold fire extinguisher erect.

c. Pull pin in handle.

d. Aim nozzle at the base of the flame. Some dry chemical extinguishers have a fixed nozzle so the extinguisher must be pointed in the direction of the fire.

e. Squeeze the two handles atop the extinguisher with one hand. This will release the powder.

f. Move the extinguisher from side to side in a sweeping motion.

Use the arms to create the sweeping motion instead of using wrist movement.

2. Have the student learn to use a CO_2 fire extinguisher. (BC).

   a. Follow steps a-c as with the dry chemical extinguisher.

   b. In most cases the CO_2 nozzle is not fixed so it has to be adjusted by hand before the fire extinguisher is used.

   c. Aim nozzle at the base of the flame. Do not touch nozzle after using as it could cause frost bite.

   d. Squeeze the two handles atop the extinguisher with one hand. This will release the CO_2 gas.

   e. Move the extinguisher from side to side in a sweeping motion. Use the arms to create the sweeping motion instead of using wrist movement.

Safety

1. When using a fire extinguisher start spraying on the fire that is closest to you and work away.

2. When fighting a fire make sure you're standing between the fire and an exit.

3. Do not fight a fire for more than the fire extinguisher is worth. Chances are if the flame cannot be extinguished within 30 seconds it will be too serious to fight by oneself.

4. No matter what size fire takes place call the fire department. It does not cost anything for service from the fire department and a person should not hesitate to call them. Do not be embarrassed if the fire has been extinguished by the time the firement have arrived.

5. Avoid purchase of the small aerosol spray cans which are supposed to be fire fighting equipment. These cans are considered by fire fighting experts as totally worthless.

Flush Tank

Lesson

1. Have student learn the problems and solutions common to the flush tank.

Materials

1. Flush tank equipped with all the parts to make it operable.
2. Crescent wrench.
3. Pliers.
4. Steel wool.

Tactual Aids

Allow the student to thoroughly investigate all of the parts found in the flush tank.

Questions and Answers

1. What are the common problems with flush tank disrepair?
   a. Water continues to run after the tank has filled. (1:224)
   b. In order for the tank to flush the handle must be held down throughout the entire flushing. (1:224)
   c. Water runs while tank fails to fill. (1:224)
   d. Handle of the flush tank is loose. (1:226)
2. Where can flush tank parts be purchased?

   Flush tank parts can be purchased in the hardware departments of many large department stores. It is a good idea to spend some time in this department to see what new and many times inexpensive items the store has to offer that could find use in your home.

3. What flush tank parts should one become familiar with?

   a. Float rod.

   b. Float.

   c. Overflow pipe.

   d. Refill tube.

   e. Tank refill valve.

   f. Stopper ball and chain.

   g. Seat.

   h. Handle and trip arm.

Procedure

1. Have student correct flush tank problem - Water continues to run after the tank has filled. (1:224)

   a. Lift cover off flush tank.

   b. Pull up on float rod and see if water shuts off. If it does, the solution to the problem is to adjust the float rod or change the float. (1:224)

   c. If the float is more than half way underwater then the float needs replacing. (1:225)

   d. Shut off the water supply to the tank by turning the valve underneath the tank clockwise. Flush toilet to remove the water from the tank. With the tank empty it makes it much easier to do repairs. (1:224)

   e. Replace float by holding onto the rod with pliers and unscrewing float counter clockwise with other hand. Pliers are needed to get a good grip on the float rod.

   f. Replace with new float by turning float clockwise onto float rod.

2. Have student correct the flush tank problem of - Handle must be held down constantly, or tank doesn't flush. (1:224)

   a. Remove flush tank top and shut off water. Flush toilet, emptying water from the flush tank.

b. Shorten chain leading to stopper ball. By removing the slack in the chain this will allow the ball to be lifted high enough where it will not be forced back over the seat prematurely by the water flow. (1:226)

3. Have student correct the flush tank problem of - Water runs while tank fails to fill.

a. If this is just an occasional problem then the solution is simple--just place the ball back over the seat or jiggle the handle.

b. If the problem is reoccuring then the ball will have to be replaced with a new one. To replace the ball you must:

1) Investigate the stopper ball mechanism. If the stopper ball is of a rather hard substance and is connected to a rod you have an older type of stopper ball mechanism. This type of stopper ball has a tendency to harden and crack with age. As a consequence, it fails to create a good seal so should be replaced. (1:227)

2) To replace the stopper ball first empty the tank. Hold the stopper ball in one hand and turn out the lift rod with the other. A pair of pliers might be needed. Next remove the wire that connects the trip arm to the lift wire. What is left of the old mechanism is the lift rod guide that is fastened to the overflow pipe. This guide can be removed with a screwdriver. (1:227)

3) This older stopper ball mechanism can be replaced with a new rubber stopper ball. With the newer mechanism the stopper ball is attached to a rubber ring which fits over and is slid down the overflow pipe until the ball is properly seated. A chain is then hooked up to the trip arm to replace the lift rod. This chain should be adjusted so that the stopper ball seats properly without slack in the chain. (1:227)

4) A problem with some stopper balls not seating properly is that the metal seat has collected some residue which prevents the seal. To correct this wipe the seat with steel wool. (1:227)

4. Have student correct the flush tank problem of - Handle of flush tank is loose.

a. Lift cover off flush tank.

b. Hold the handle with one hand and tighten the nut on the inside of the tank with the other by turning counter clockwise. (1:226)

c. Do the initial tightening by hand and finish it with the use of a crescent wrench. Take care not to over tighten the nut and strip the threads. (1:226)

Fuse Box

Lesson

1. Have student remove fuse from fuse box and replace it with a new one.

2. Have student reset a circuit in a circuit breaker box.

Materials

1. A fuse box equipped with:

   a. Live circuits.

   b. Circuits adapted for fusestats and circuits left alone for use with fuses.

   c. Braille Dymo tape labels marking the circuits. For example, on the inside of the fuse box door or on the box itself it can read "#1 - Kitchen". Then under the first fuse can read the corresponding "#1".

2. Fuses and Fusestats.

3. Circuit breaker box.

Questions and Answers

1. What is a fuse?

   A fuse is a piece of metal which connects the electricity from the outside wires to the wires on the inside. The metal in a fuse is strong enough to carry the same amount of electricity as the wires of the circuit it is plugged into. Any electrical current that is more than what the fuse can carry will melt the metal and disconnect the electric current from the house. The melting metal has the same effect as cutting the wires.

2. Why do we call fuses "safety valves?"

   Fuses are called safety valves because they prevent the electrical wires from overheating and starting on fire. Wires

are made to carry only a certain level of electricity and the fuse is made to carry the same amount of electricity as the wires of the circuit. For example, a wire made for 15 amperes needs a 15 amp fuse. If an appliance pulls more than the wire can bear then the fuse will "blow" thus protecting the wire. This is why it is important not to put a fuse in which is larger than the circuit. In other words, a 20 amp fuse in a 15 amp circuit will not "blow" when the wires reach their capacity. As a result the wires will burn before the fuse stops the electric flow.

3. What are the common causes for fuses blowing?

   a. Overloading circuits - This happens when too many appliances are plugged into the same circuit. Know the capacity of each circuit and never go over it. Remember that heating appliances draw tremendous amounts of electricity.

   b. Short circuits - This is the process of the electrical current finding a route of less resistance. For example, if bare electrical wires are touching the frame of a washing machine then the electricity might well set up a route of least resistance by travelling through the frame. Or, badly worn cords might allow the wires within a cord to touch each other and thus disrupt the current flow.

   c. Motors - Motors can cause a fuse to blow in two ways:

      1) A motor might require more electricity during the initial starting than after it has been running a while. Therefore, a motor could pull more electricity than the fuse is capable of handling, even though this extra pull lasts only a few seconds. This is a problem with large heating and cooling appliances. To eliminate such a problem time lag fuses should be employed. A time lag fuse will withstand a few seconds of strong electrical current until running capacity has been attained.

      2) The belts on the pullies of the motor might be a cause of fuses blowing. If the belts are too tight it will cause the motor to labor and consequently use more electricity.

4. What is a fusestat?

   A fusestat is a safety fuse that cannot be placed in any other circuit except that which has been adapted for it. For example, a circuit that requires a 15 amp fuse has an adapter placed in the fuse box which only allows 15 amp fuses to be screwed into the circuit. This prevents people from putting in larger fuses and thus negating the safety valve principle of the fuse.

5. Why is it dangerous to place a penny in the circuit of a fuse box?

Placing a penny in the circuit of a fuse box is one of the most dangerous things a person could do. A penny does not afford the electrical wiring any protection from overloading and possibly burning. The metal in the fuse is manufactured to melt at a given current flow, thus preventing the wiring from becoming hot and weakened. A penny, on the other hand, would not melt at the precise time for protection of the wiring. Instead, a penny would continue to connect the electrical current with the appliance, causing fire within the wiring. In other words, the melting point of a copper penny is much too high to act as a safety valve against extreme current flow.

6. How can you mark the circuits in a fuse box?

   a. Loosen one fuse by giving it one quarter turn counter clockwise.

   b. Go through the house and investigate what outlets fail to work and make note of them.

   c. Retighten fuse by turning clockwise.

   d. Repeat a, b, and c for each fuse.

   e. Write in braille on Dymo tape what each fuse is for. For example, the first fuse might supply electricity to the kitchen, so "#1 - Kitchen" would be written. Place this information on the fuse box where it can be easily read.

   f. Mark the fuse which corresponds with the label. For example, under the fuse which supplies electricity to the kitchen mark "#1".

7. What is a circuit breaker box?

   A circuit breaker box performs the same function as a fuse box. The difference between the two is that a circuit breaker box has "switches" instead of fuses.

Procedure

1. Have student remove fuse from fuse box and replace it with a new one.

   a. Correct the problem that caused the fuse to blow. This will probably come in the form of unplugging an appliance or fixing a worn cord.

   b. Shut off the electricity to the fuse box. This is done by

locating the main switch. There are two types of main switches:

1) The type that is found inside the fuse box door right above the fuses. This main switch has a wire handle which must be grasped firmly and pulled straight out. There might be other switches that resemble the main switch which are separate circuits to large appliances such as the kitchen range. Learn which is the main switch.

2) The type which is found on the side of the fuse box. This main switch is a lever which can be pushed upward or pulled downward. In the up position the fuse box is being supplied with electricity. In the down position the electricity is shut off from the fuse box.

c. Remove the old fuse by turning it counter clockwise. Throw the old fuse away immediately so it does not become confused with a new one.

d. Replace the old fuse with a new one by turning fuse clockwise into the socket. Caution should be taken here not to replace the old fuse with a larger one. With a fusestat only the right size fusestat will fit into the circuit.

e. Turn on electricity.

Note: If the circuit does not work after a fuse has been changed than the fuse probably needs to be tightened down some more. This is particularly true with fusestats because of a metal spring found underneath the head. Fusestats should be turned another ¼ turn after they are turned down snugly. This extra ¼ turn will assure contact.

2. Have student reset a circuit in a circuit breaker box.

a. Correct the problem which broke the circuit.

b. Find the circuit that has been broken. You can do this by opening the door on the circuit breaker box and investigating the switches. The switches resemble light switches and each represents a separate circuit. The switch of the broken circuit will be midway between the "off" and "on" positions.

c. Turn the switch of the broken circuit to the "off" position.

d. Then turn the switch to the "on" position. This will reset the circuit.

<u>Safety</u>

1. Shut off electricity to the fuse box before changing a fuse.

2. Have hands, feet, floor, and fuse box dry before attempting to change a fuse.

3. Have new fuses handy when changing a fuse. Also, mark the boxes that the fuses come in as to the contents; for example, "15 amp".

Glazing

Lesson

1. Have student measure window frame for glass.
2. Have student put a new window in the window frame.

Materials

1. A window frame.
2. Plexiglas window pane (It is recommended that plexiglas be used because there is less of a chance that it will be broken in storage or during the lesson).
3. Glazing putty.
4. Putty knife.
5. Glazier's points.
6. Braille ruler.

Procedure

1. Have student measure window frame for glass.
   a. If it is possible take the window frame out so the work can be done on a table or workbench.
   b. Clean the inside of the window frame so it is free of loose paint, dirt, moisture, and old glazier's points. (1:312)
   c. Brush the grooves with linseed oil, waterproofing, or paint to seal it from moisture. (1:312)
   d. Using a braille tape rule or braille ruler measure the window. Measure from the grooves (rabbets) that will hold the window to get the dimensions of the window pane needed. Subtract 1/16" from the length and width measurement to insure that the window pane will not be too large. (7:232)
2. Have student put a new window in the window frame.

a. Taking some putty, spread a thin layer in the grooves that will hold the glass. By doing this it will prevent moisture from entering, stabilize the window, and produce an airtight seal.

b. Place the window in the grooves of the window frame.

c. Taking the glazier's points, place them every 6 to 8 inches around the window. The points can be wiggled into the wood by using the blade of the putty knife or the blade of a screwdriver. (7:232)

d. Once the glazier's points have been fastened in the wood cover the points and the groove with more putty.

e. Using the putty knife bevel the edges of the putty. Pressure should be applied on the end of the putty knife blade with the fingers of the free hand. By applying pressure at this point the putty knife will trim the excess putty on the window as well as on the window frame. The putty knife's blade should be dragged over the putty, not pushed into it. Bevel the edges while going in the same direction; for example, clockwise, because in this manner the putty excess is kept in front of the knife. Allow 48 hours for the putty to dry before it is painted.

f. The same process is followed with metal window frames, except that metal clips are used instead of glazier's points. With the metal clips one end fits in the hole in the metal frame and the other end of the clip creates a spring action which holds the window. (1:313)

g. Make sure to put the lid of the putty can back on tightly so it will not dry up.

Safety

1. If there is broken glass to be removed wear gloves to prevent yourself from being cut.

2. Dispose of broken glass immediately.

Hammers

Note: The Hammers Lesson should be preceded by the "Nails and Woodscrews Lesson".

Lesson

1. Have student drive a nail using a claw hammer.
2. Have student pull a nail using a claw hammer.
3. Have student drive a nail using a brad pusher.
4. Have student start a nail with the use of one hand.

Materials

1. Claw hammer.
2. An assortment of common nails.
3. Brad pusher.
4. Scrap wood.

Questions and Answers

1. What kinds of hammers can be purchased?

    a. Claw hammer for driving nails.
    b. Rubber hammer for finished metal work.
    c. Wooden mallet for use with wood chisels.
    d. Ball peen hammer for machine work.
    e. Sledge hammer for heavy construction.
    f. Upholsterer's hammer for use in driving tacks.

2. What weight of claw hammer is best suited for use by a woman? A man?

    a. A woman should use a 13 oz. hammer.
    b. A man should use a 16 oz. hammer.

3. What should you look for when buying a claw hammer?

a. A hammer should have a balanced feel when you hold it in a hammering position.
b. A hammer should be purchased that will be appropriate for the person using it, as well as for the job.
c. The head of the hammer should be fastened securely to the handle.

4. How can you help avoid hitting your finger when driving a nail?

When nailing hold the nail between the thumb and forefinger near the head, not near the point. Then if the hammer slips and hits your fingers it will push them away instead of smashing them against the wood. Holding the nail in this manner also seems to help the student locate the head of the nail when hammering.

Note: Some students prefer holding the nail down at the point rather than below the head. The advantage of such a method is that the nail can be held upright more easily.

5. What is a brad pusher?

A brad pusher is a small hand tool used to place 1" brads (small nails) and smaller into the wood. The brad pusher holds the nail in the barrel of the tool with a magnet. Not needing a hand to hold the nail makes the brad pusher especially useful when nailing in tight corners or hard to reach places. The brads and brad pusher can also be used for picture frames, window screens, mouldings, cabinets, antiques, miniatures, models, and radios and televisions.

Procedure

1. Have student drive a nail using a claw hammer.

a. Hold the nail between the thumb and forefinger just below the head.

b. With a wrist and slight forearm action hit the nail with one or two light taps to start it in the wood. The hammer should be held near the end of the handle and the face of the hammer should be at right angles from the stock.

Note: It takes practice before one can accurately locate the head of the nail. In an attempt to reduce the practice time some students have found that by holding their arms into their sides that this reduces the variance in pinpointing the head of the nail. This creates a consistent forearm movement which aids in the location of the nail.

c. After the nail has been started continue to strike it with medium blows using a wrist action.

d. When the head of the nail is close to the wood finish the driving with light blows so as not to mar the wood excessively.

Note: When nailing near the edge of a piece of wood you can prevent the wood from splitting by blunting the point of the nail. With the point blunted the nail will punch the fibers down instead of pushing them aside. (1:10)

2. Have student pull a nail using a claw hammer.

a. Turn claw hammer upside down where the head is resting on the wood.

b. Slide the claws on the hammer toward the nail until the top of the nail is securely wedged in the space between the two claws, and where the head of the nail is on top of the claws.

c. Holding the handle at the very end for maximum leverage, pull back on the handle in the opposite direction from the claws. (Make sure that the head of the hammer is not hanging off the edge of the wood because this will not give you the leverage you need). Height will have to be added to the hammer when pulling a long nail. The added height will give the hammer leverage again for pulling. To do this, wood shims are placed under the head of the hammer. Wood shims will also prevent the hammer from marring the wood when placed under the hammer head.

3. Have student drive a nail using a brad pusher.

a. Hold the brad pusher with the barrel pointing upwards.

b. Put the brad in the barrel head first. The magnet inside the barrel will hold the brad in place.

c. Turn the brad pusher upright and place the tip of the barrel on the wood to be nailed.

d. Push downward on the handle of the brad pusher until the nail is completely driven into the wood.

4. Have student start a nail with the use of one hand.

Note: This method is extremely valuable to the one-handed person, or to anyone where circumstances warrant its use. The method requires a great deal of practice. Also, there are variations

of this method using the nose and the top of the hammer, rather than the side.

a. Hold the hammer by the head. The position should resemble a clenched fist with the handle of the hammer running along under the arm holding the hammer.

b. Place the nail between the second and third fingers on the underside of the hammer head. These two fingers grasp the nail just under the head of the nail while holding the head of the nail against the hammer head.

c. With the hand, nail, and hammer acting as one unit bring the nail down on the wood with a reasonable amount of force. This will start the nail in the wood.

d. With the nail started in the wood, return the hammer to a normal position and complete the task of driving the nail.

Safety

1. Do not leave hammers lying near the edge of a table or workbench where they can be knocked off onto the floor or onto your foot.

2. When storing hammers make sure they lie flat instead of claws up. If hammers are stored in a hanging position, make sure they hang securely so they cannot be accidentally knocked off.

3. Do not hold your head directly over the hammering.

Hand Sanding

Lesson

1. Have student prepare sandpaper for use.
2. Have student sand down a small piece of board.
3. Discuss special sanding problems.

Materials

1. Sandpaper (preferably aluminum oxide sheets of 80, 100, 120, and 150 mesh).
2. Sanding block.
3. Small board.
4. Rag and water.

Tactual Aids.

The instructor could provide a very fine and very coarse paper for contrast; for example, 24 and 400 mesh.

Questions and Answers

1. Sandpaper can be divided into two classifications. What are they?
   a. Natural abrasives.
      1) Flint - used on paint and gummy wood.
      2) Emery - used on metals.
      3) Garnet - used in general woodworking.
   b. Manufactured abrasives.
      1) Silicon carbide - used on soft metal and glass.

2) Aluminum oxide - used on wood and metal. (1:41)

2. What abrasive finds extensive use in the metal polishing and woodworking industries?

Aluminum oxide. This abrasive has tough wearing qualities that prevent its breaking easily. This abrasive can be purchased under the trade names of Alundum, Adolox, Aloxite, and Three-M-Ite.

3. What determines the fineness or coarseness of sandpaper?

The fineness or coarseness of sandpaper is determined by the number of openings per linear inch in the silk screen used to sift the abrasive. The more openings per linear inch the finer the abrasive, and conversely the fewer the openings in the silk screen per linear inch the coarser the abrasive. (2:16) Fineness and coarseness are rated by mesh numbers. The finer the abrasive the higher the mesh number. The mesh numbers are (going from coarse to fine): 24, 36, 40, 50, 60, 80, 100, 120, 150, 180, 220, 240, 280, 320, 360, 400, 500, and 600. The medium range is 80, 100, 120, and 150. (3:3)

4. What is meant by A, C, D, E, J, and X when referring to sandpaper backing?

a. A, C, D, and E refer to the different weights of paper backings available for sandpaper. "A" weight paper is a very lightweight paper known as finishing paper. "C" and "D" are medium weight backings known as cabinet paper. "E" is a very heavy weight backing used for roll or belt type sandpaper. (3:4)

b. J and X refer to the two different types of cloth backings available for sandpaper. The "J" weight represents the light weight and the "X" represents the heavy weight. (3:4)

5. What are some household uses for sandpaper?

a. Finishing.

b. Paint removal.

c. Planing.

d. Polishing.

e. Rust removal.

f. Shaping.

Procedure

1. Have student prepare sandpaper for use.

    a. Tear sandpaper to the proper size by using a straight edge. A standard sheet of sandpaper (9" x 11") can be torn into 4 to 6 sheets for use with a sanding block. (5:195)

    b. To make the sandpaper more flexible:

        1) Hold the sandpaper by the upper left and lower right hand corners with the abrasive side facing you.

        2) Placing the sandpaper on the work bench drag it slowly over the edge.

        3) Hold the sandpaper by the upper right and lower left hand corners with the abrasive side facing you.

        4) Repeat step 2.

        5) Bend sandpaper around the sanding block with the abrasive side facing outward.

2. Have student sand a small piece of board.

    a. When sanding you must start with the coarse sandpaper and go finer. This is done in a prescribed manner--never jumping more than two numbers. For example, after using 80 mesh go to 100 or 120 mesh.

    b. Clamp board in vise if possible.

    c. Sand the top and bottom surfaces of the board by sanding with the grain. Cover the whole surface evenly and do not round the corners. (5:196)

Note: Sanding lengthwise will more than likely always be with the grain. However, if there is any doubt the grain can be raised by slightly wetting the wood. With the grain raised you will be able to feel its direction.

    d. To sand the edge, place board in a vise with the edge of the board higher than the top of the vise. Hold sanding block with both hands with the thumbs on top and the fingers underneath. The fingers on the underside of the sanding block should run along both sides of the wood. This will keep the sanding block square with the wood. (5:197)

    e. Sand the end grain by going in one direction--not back and

forth. This will give you a smoother sanding job. (5:197)

f. Remove sharp edges by lightly rubbing sandpaper over them. (5:197)

3. Discuss special sanding problems.

a. Sanding convex surfaces - Use sandpaper without a sanding block. Holding the sandpaper with the fingers, allow the paper to conform to the shape of the wood. (5:197)

b. Sanding concave surfaces - Wrap sandpaper around a half-round file or a dowel rod. (5:198)

c. Sanding small pieces of wood - Wrap sandpaper around a sanding block and place it in a vise with the abrasive side up. Then hold the small piece of wood and move it back and forth across the paper. (5:198)

Handsaws

Lesson

1. Have student measure a certain length of board with a braille ruler, mark it with a scratch awl, and draw a straight line with the scratch awl and try square as a guide for cutting.

2. Have student use a crosscut saw to cut along the line marked with the scratch awl, both free hand and with the use of a saw guide.

3. Have student remove and replace blade on a hacksaw as well as check the different length settings of the hacksaw frame.

4. Have student cut a piece of metal with a hacksaw.

Materials

1. Braille ruler (Perkins), scratch awl, and try square.

2. Crosscut saw.

3. Hacksaw.

4. Straight edge board and C-clamps for saw guide.

5. Wood and metal to use for sawing practice.

Tactual Aids

Have the student compare the difference between a crosscut and a ripsaw (if a ripsaw is available) by laying them both flat and counting how many saw teeth there are per inch for each saw.

Questions and Answers

1. How can a crosscut saw be differentiated from a ripsaw?

Crosscut saws have smaller teeth than do ripsaws. Crosscut

saws have from 8 to 12 teeth per inch, whereas the ripsaw has 6 teeth or less per inch. A crosscut saw with 8 teeth per inch is recommended for home use because it can be substituted for a ripsaw if necessary.

2. Why does a ripsaw have larger teeth than that of a crosscut saw?

The ripsaw has larger teeth because it cuts with the grain of the wood and needs large teeth to plow through the wood. A crosscut saw cuts across the grain so it needs smaller teeth so the saw can slide across easily without tearing up the grain.

3. What kind of blades are available for use with a hacksaw?

Hacksaw blades come in different sizes, varying with the number of teeth per inch. The range is from 14, 18, 24 to 32 teeth per inch. The blade that will perform the most all around functions for the home situation is the one with 18 teeth per inch. (1:15)

Procedure

1. Have student measure a certain length of board with a braille ruler, mark it with a scratch awl, and draw a straight line with the scratch awl and try square as a guide for cutting.

   a. Lay the braille ruler on the board so the end of the ruler is aligned with the end of the board.

   b. To get the desired length of the board count along the ruler the number of inches you want the board to be, and mark it by placing the point of the scratch awl in the small notch atop each inch mark. (On the braille ruler from Perkins the markings are as follows: 1/4" and 3/4" marks are represented by one dot which feels like the braille letter "A", the 1/2" mark consists of two dots which feel like the braille letter "B", and the inch mark which feels like the braille letter "L"). Hold the scratch awl with one hand and with the other hit the top of the awl to enlarge the hole so it can be felt easier. If the wood is a hard wood the top of the awl might have to be struck with a leather mallet to make a large enough hole to feel. To enlarge the hole make a circular motion with the handle of the awl while the point remains in the hole.

   c. Leave the awl in the hole and move the metal part of the try square until it is resting against the awl. Straighten the try square to a right angle by keeping the metal part

against the awl and moving the wooden part against the edge of the wood where there is no space between them. Make sure the wooden part of the try square is on as much wood as possible.

d. Hold the try square with the left hand if right handed. Have the metal part of the try square to the left of the awl. Hold the try square tightly against the wood.

e. Remove the awl with the right hand and scratch a line in the wood. Hold the awl like you would hold a pencil with the point of the awl against the metal portion of the try square. When scratching the line tilt the handle outward away from the try square because this will aid you in keeping the point against the metal portion of the square.

f. Trace over the line scratched in the wood until you are able to feel it tactually.

2. Have student use a crosscut saw to cut along the line marked with a scratch awl, both free hand and with the use of a saw guide.

a. Place wood in a vise with the mark for cutting one hand width from edge of the workbench. There are right and left handed vises--a right hand vise allows you to have your right hand closest to the table when holding the saw, and the left hand farthest from the table supporting the piece of wood being cut. The opposite is true for the left hand vise.

b. If right handed stand with the left foot forward and the right foot back. The opposite is true if lefthanded.

c. Hold the saw in the right hand with the left hand free to support the piece of wood being sawed off.

d. Place the saw teeth on the line marked in the wood. Place the thumb of the left hand against the blade, not under it, to provide a guide to keep the saw on the mark.

e. Draw back on the saw to start a niche to help guide the saw in a straight line.

f. Hold the saw at a 45 degree angle and saw with the force just applied to the downward stroke. If you stray from the mark do not try to bend the saw blade back to the mark, but rather return to the spot where the saw left the mark and begin again.

g. Continue to saw the wood until the wood is completely sawed through. Do not break off the wood when only a little sawing is left. Breaking the wood will cause splintering into the rest of the wood stock, thus damaging it. Finish the sawing by light strokes until the wood is completely cut off with the other hand.

h. If the student is unable to follow a mark without a saw guide, then place a straight edge along the line marked in the wood and clamp it to the piece of wood being cut. Another piece of wood with a straight edge will provide a good guide, and C-clamps will provide an easy to use clamping device.

3. Have student remove and replace blade on a hacksaw, as well as check the different length settings of the hacksaw frame.

a. To remove an old hacksaw blade find the end of the blade closest to the handle. At this point there will be a wing nut that should be turned counter clockwise. The counter clockwise motion of the wing nut will loosen the tension on the blade and will allow the student to remove it.

b. Take the new blade in hand and find out which way the teeth are pointing. This is a difficult job because most hacksaw blades have small teeth, but a thorough investigation with the finger tips and fingernails will give you a good clue.

c. Place the blade on the hacksaw with the teeth pointing away from the handle.

d. Find the two metal pieces that hold the blade in place. Remember that one is attached to the wing nut and the other is opposite it on the end of the hacksaw shaft. On each metal piece there is a small metal tooth which goes through the hole in the end of the blade. Place the blade back on by placing the two metal teeth through the holes in the blade.

e. Place the hacksaw on its side and have student put pressure on the center of the blade to help hold it in place while the other hand turns the wing nut clockwise.

f. Some hacksaws are adjustable to accommodate different lengths of blades. To change the length of the hacksaw shaft to accommodate a different length blade, first remove old blade. Check the top of the metal shaft and notice how it consists of two pieces. One piece has notches which mark different blade settings. This piece slides into the other piece and

hooks securely when a notch of the first piece is aligned with the metal bar of the second piece. The bar that hooks into the notch is located right where the first piece enters the second piece.

4. Have student cut a piece of metal with a hacksaw.

   a. A line can be marked in metal with the use of a try square and scratch awl or with a file. In either case it is a good idea to file a notch in the material to give the hacksaw a good start.

   b. Place metal in a vise with the surface of the metal in a vertical position. If you are sawing a thin piece of metal place it between two pieces of wood to keep from bending the metal. (1:16)

Note: With metal pipes place the pipe in the jaws of pliers and then close the vise on the outside of the plier's jaws. This prevents the pipe from slipping in the vise. (1:33)

   c. Place the hacksaw blade on the mark to be cut.

   d. Hold the handle of the hacksaw with the right hand and hold the opposite end of the hacksaw with the left hand to aid in guiding the blade accurately. The opposite is true of hand positioning if left handed.

   e. With slow and steady strokes begin cutting the metal. Do not put an angle on the hacksaw, but rather keep it straight. Put pressure on forward strokes only, lifting blade slightly at the end of the stroke to return it to the starting position.

   f. If the shaft of the hacksaw will not allow you to cut completely through the metal, turn the metal over and begin from the opposite end. If after doing this you are still unable to complete the cut because the shaft is in your way remove the blade and cover one end with tape so you can hold onto it and resume cutting. (1:16)

Safety

1. Keep saws out of reach of children.

2. If saws are stored hanging up, make sure they are hung securely. If they are stored lying on their sides, make sure they are wrapped in heavy paper or kept in their original boxes.

3. Never try to sharpen a handsaw because it needs an expert's touch.

4. When sawing through a piece of wood do not place all of your weight behind the saw or keep yourself off balance.

5. When removing rust by rubbing the blade with steel wool be sure to stay clear of teeth. The teeth of saws can be so sharp that a cut received by them in a quick motion can go undetected for awhile.

Hangers

Note: Remember that nails and woodscrews (mentioned in another lesson) are two of the most common materials used for hangers. When using nails and woodscrews try to fasten them to the studs behind the wall surface for greater strength. You can find studs by: tapping the wall and listening for the changing sound, by looking for the nails used to fasten wall coverings to studs, or by using a stud finder magnet which will be attracted to the nails in the wall. Once you have found a stud you can find the others by measuring--studs are usually nailed 16" apart from center to center.

Lesson

1. Have student apply an adhesive hanger.
2. Have student use a picture hook and nail as a hanger.
3. Have student use a plastic screw anchor (Yellow Jacket) as a hanger.
4. Have student use a toggle bolt as a hanger.
5. Have student use a screw anchor as a hanger.

Materials

1. Adhesive hanger.
2. Picture hook and nail. (The nail comes with the picture hook when purchased).
3. A Yellow Jacket and screw to fit it. (Yellow Jackets will usually accommodate four size screws. For example, nos. 6, 8, 10, and 12 screws).
4. Toggle bolt.
5. Screw anchor.
6. Cinder block.
7. Wood in thickness that can be used for the toggle bolt, anchor screw, and picture hook.

8. Electric drill and drill bits for drilling holes to accommodate the toggle bolt, screw anchor and Yellow Jacket.

Note: Drilling in cinder block requires that you use a masonry drill bit with a carbide tip. There are special electric drills made for use in drilling masonry; however, a regular electric drill will also work. The masonry drill bit can be purchased separately at such stores as Sears at prices of around $ .99 to $1.79.

Tactual Aids

I find it helpful when explaining the expansive ability of the Yellow Jacket to let the student hold onto one while he turns in the screw. This will allow him to see what the Yellow Jacket does inside the wall.

Questions and Answers

1. What are some uses for hangers in the home?

   a. Hanging pictures.

   b. Hanging mirrors.

   c. Hanging curtain rods.

   d. Hanging shelves.

   e. Hanging clocks.

   f. Hanging towel bars.

   g. Hanging swag lamps.

2. What should you keep in mind when purchasing a hanger?

   a. You should first consider the weight of the object to be hung and select the hanger accordingly.

   b. You should keep in mind the type of wall material the object will be hung on.

   c. You should consider the shape of the object. For example, an object that will hang close to the wall (e.g., mirror) will not need as much support as an object that will hang out from the wall (e.g., kitchen cabinet).

d. Finally, some thought should be given to whether the fixture to be hung will be temporary or premanent.

Procedure

1. Have student apply an adhesive hanger.

Note: It is not recommended that adhesive hangers be used on paper wall surfaces such as wallpaper or plasterboard. If adhesive hangers are used on such surfaces they will tear the outer paper surface when the hangers are removed. Adhesive hangers can be used on wood, cinder block, metal, tile walls, and glass.

a. Make sure that the surface where the adhesive hanger will be placed is clean and dry.

b. Remove tape from the back of the adhesive hanger. (The adhesive backing on some have to be wetted).

c. Place the adhesive part of the hanger against the wall surface, making sure that the hook is at the bottom of the hanger.

d. Apply pressure on the hanger with the hands by rubbing in a circular motion. Pressure should be applied for one minute to get a good contact started. The adhesive is pre-dried for use on non-porous surfaces, so only a short time is needed before the hanger is securely in place. Complete drying time usually does not take more than an hour.

e. Small adhesive hangers are light weight hangers which usually will not support a great deal of weight. These hangers are used mostly for hanging pictures.

Note: It is easier to keep pictures straight if two hangers are used.

2. Have student use a picture hook and nail as a hanger.

Note: The nail used with such picture hooks is too weak to use in hardwood walls.

a. Place the flat side of the hook against the wall.

b. Slip the nail through the hole at the top of the hook. The nail is slanted at an angle so as to provide more strength.

c. Tap the nail in with light blows as far as the nail will go. The hanger is then ready for immediate use.

3. Have student use a Yellow Jacket and screw as a hanger.

Note: Yellow Jacket hangers are for use in cinder block walls.

a. With an electric drill and masonry bit drill a hole the same size as the Yellow Jacket.

b. Place Yellow Jacket in the hole.

c. With a hammer pound the Yellow Jacket in so it is flush with the wall.

d. Place screw in the Yellow Jacket by turning it clockwise.

4. Have student use a toggle bolt as a hanger.

Note: Toggle bolts are used as hangers on thin wood walls where heavier objects are to be hung. The wing-like nut of the toggle bolt spreads the weight of an object over more area.

a. Drill a hole in the wall that will accommodate the diameter of the toggle bolt. To find the diameter pull the wings of the toggle bolt together and measure. The drill bit used for this kind of bolt usually is a spade bit because it can give you a large hole with the use of a ¼" or 3/8" electric drill.

b. Remove the bolt from the wings and place the object to be hung on the bolt. Replace the wings.

c. Push the wings through the hole.

d. Tighten the bolt to the object by pulling back on the bolt until the wings are against the inside of the wall while simultaneously turning the bolt clockwise. If the bolt is turned counter clockwise the wings will come off the bolt and fall inside the wall. When you are ready to remove the toggle bolt it is impossible to recover the wings--the wings fall behind the wall and the hole will have to be covered with a filler of some kind.

5. Have student use a screw anchor as a hanger.

Note: Screw anchors are useful as hangers on hollow doors and hollow walls. (Screw anchors are sometimes sold under the name of (hollow door fasteners"). You must roughly know the thickness of the door or wall before you purchase a screw anchor.

The screw anchor is a long term hanging device because the anchor expands behind the door to create a permanent fixture. The screw can be removed as many times as need be, but the anchor remains in the door.

a. Drill a hole in the hollow door to accommodate the portion of

the anchor behind the anchor's face. (The face of the anchor is the round metal disc which surrounds the head of the screw when the screw is in place).

b. Remove the screw from the anchor.

c. Place the anchor in the hole and with a hammer tap it flush with the door. The small metal teeth found underneath the face will fasten the face to the outside of the door. This fastening keeps the anchor from slipping when the screw is being turned into the anchor.

d. Turn the screw clockwise into the anchor until you are unable to turn it anymore. It is this tightening that expands the anchor behind the door. After the expanding of the anchor has taken place the screw can be applied and removed from the anchor indefinitely.

Safety

1. Do not leave the key in the chuck of the electric drill when drilling.

2. Wait until the drill bit has stopped completely before setting the drill down.

3. Do not touch the drill bit while the electric drill is running.

4. Know the weight capacity of your hanger so you do not overload it with a heavy object.

Nails and Woodscrews

Note: This lesson should precede the "Hammers" and "Screwdrivers" lessons.

Lesson

1. Have student pre-drill for a woodscrew with the use of a drill index and hand drill.
2. Have student pre-drill for a woodscrew with the use of a combination bit and electric drill.

Materials

1. Drill index, hand drill, and countersink.
2. Combination bits and an electric drill.
3. Assortment of flat, round, and oval head woodscrews for samples.
4. Assortment of common nails, box nails, and finishing nails for samples.

Tactual Aids

Use a large woodscrew, for example a flat head 2" no. 12, when initially talking about the holes that need to be pre-drilled for the screw. With the use of a large woodscrew the students can more easily feel the head, shank, and threaded parts of the screw.

Questions and Answers

1. What kinds of nails can be purchased?

   There are basically three major kinds of nails that are widely used:

   a. Common nails, used for structural building and rough carpentry.

b. Box nails, like common nails, they are used for rough carpentry; however, they are better suited for soft wood because they drive easier and do not split the wood.

c. Finishing nails, used for finishing work as with cabinets, trim, and paneling.

2. How are nails manufactured?

Nails are made of wires which, varying in gauge (weight and thickness), are cut to prescribed lengths. For example, a 2d nail (referred to as 2 penny) is 1" long and made from a no. 15 gauge wire. A 40d nail is 5" long and is made from no. 4 gauge wire.

3. What advantages and disadvantages do nails have as fasteners?

a. Advantages:

1) Fast application.
2) Cheaper than woodscrews.

b. Disadvantages:

1) Tend to loosen as wood dries out.
2) Difficult to retighten.
3) Split wood on occasion.
4) Hammering sometimes leaves marks on wood.
5) Possibility of hurting one's finger during hammering.

4. What does the term "penny" mean when referring to nails?

The term "penny" refers to the original cost per pound. For example, 3" common nails originally cost 10¢ per pound. Now the term refers to the size of the nail. For example, a 10d nail refers to a nail that is 3 inches long.

Note: At this point I usually teach the student a method on how to memorize the sizes of nails using the term "penny". First, I tell the student that a 2d nail is 1" long and that for each penny higher the length increases $\frac{1}{4}$". Thus, a 6d nail is 2" long and a 10d nail is 3". After 10d the nail sizes progress to 12d, 16d, 20d, 30d and 40d. The length increases $\frac{1}{4}$" for the 12d and 16d nail, but then progresses $\frac{1}{2}$" for the 20d, 30d, and 40d. Thus, the students should come up with 5" for the length of the 40d nail.

5. What advantages and disadvantages do woodscrews have as fasteners?

a. Advantages:

1) Woodscrews provide for a very secure joint, much better than nails.
2) Woodscrews can be retightened.
3) A project can be disassembled more easily when fastened with woodscrews.
4) Applying woodscrews does not mark the wood like a hammer might.
5) Woodscrews can be used over again.

b. Disadvantages:

1) Woodscrews are more expensive than nails.
2) Woodscrews take longer to apply because of the pre-drilling that is necessary.

6. How are woodscrews identified?

Woodscrews are identified by 3 aspects:
a. Head shape: Flat, round, or oval.
b. Length.
c. Number: The greater the number the greater the diameter of the shank.

7. When fastening two boards together with a woodscrew, how long should the screw be?

The woodscrew should be roughly 1/8" shorter than the width of the two pieces of wood.

8. What are the three steps involved in drilling for a flat head woodscrew?

a. Drilling the pilot hole. This hole is drilled the length of the screw with a drill bit just a little smaller than the threaded part of the woodscrew.

b. Drilling the shank hole. This hole is drilled the length of the head and shank of the woodscrew. (The shank is the smooth part of the woodscrew between the head and the threads). The drill bit used for this step is slightly larger than the shank. This hole is needed because the shank does not have any threads, so a larger hole prevents it from binding.

c. Drilling the countersink hole. This hole resembles that of a funnel-like hole which allows the flat head screw to lay even with the surface of the wood. Countersinking is also done for the oval head woodscrew, but not for the round head woodscrew. Drilling is done with a countersink.

9. What methods are available for pre-drilling for a woodscrew?

   a. Nail. Woodscrews too small to drill for can be started in a hole made by a small nail.

   b. Drill index, hand drill, and countersink. The drill index provides the various size drill bits to drill the pilot and shank holes. The hand drill is the tool in which the drill bits are held and which provides the turning movement necessary for drilling. The countersink used in the hand drill makes the hole for the head of the screw.

   c. Combination bit and electric drill. The combination bit, when used in an electric drill, will drill the pilot, shank, and countersink holes in one process. The combination bit can also be used to counterbore for the woodscrew. Counterboring is the process of making a large enough hole which will allow the head to be set beneath the surface of the wood.

Procedure

1. Have student pre-drill for a woodscrew with the use of a hand drill and a drill index.

Note: Drill indexes can be purchased in many different sizes, depending on the need. A large and expensive drill index will include bits ranging from 1/16" to 1/2". Smaller indexes which include drill bits from 1/16" to 1/4" are more suitable for needs around the home. These drill indexes sell in the $5 to $7 range.

   a. For drilling the pilot hole find a drill bit which is somewhat smaller than the threaded part of the screw. Lay the woodscrew beside the drill bit with the point of the woodscrew and the point of the drill bit lying next to each other. Mark the length of the woodscrew on the drill bit with a piece of masking tape. Now, hold the handle of the hand drill and handle of the wheel of the drill in one hand and turn the drill chuck (at the tip of the drill) with the other hand clockwise. This clockwise motion will completely shut the drill chuck. Now, turn the chuck in a counter clockwise motion a little at a time until the smooth end of the drill bit fits in the end of the chuck. Once the drill bit has been placed in the chuck turn the chuck clockwise as far as it will go. This will tighten the drill bit in the chuck. Now, turn the hand drill right side up where the point of the drill bit is on the wood. Turn the crank in a clockwise motion to drill. Drill into the wood until the tape on the drill bit touches the surface of the wood. To remove the drill bit continue to turn the drill in a clockwise motion and lift up. Remove the drill bit by

turning the chuck counter clockwise while holding on the handle of the drill and the handle of the crank.

b. For drilling the shank hole find a drill bit that is a little larger than the shank of the woodscrew. Mark the length from the head of the screw to the end of the shank on the drill bit with a piece of masking tape. Place the drill bit in the hand drill and drill in the pilot hole until the tape touches the surface of the wood. Remove the drill bit.

c. For drilling the countersink hole a countersink must be placed in the hand drill. A countersink will drill the countersink hole for all size woodscrews, depending on how many times the countersink is turned on the wood. The student must periodically stop and check the countersink hole to make sure that it is not being drilled too large. He can do this by turning the screw upside down where the head is resting in the hole. When the outer edge of the hole is the same size as the outer edge of the head of the woodscrew the countersink hole is the right size. (5:190).

2. Drilling for pilot, shank, and countersink holes with the use of a combination bit and electric drill.

Note: A combination bit is made to fit only one size woodscrew. For example, a $1\frac{1}{2}$" no. 10 woodscrew will need a $1\frac{1}{2}$" no. 10 combination bit. Also, I find it helpful if the students take the time and try to tactually differentiate the parts of the combination bit which drills the three holes.

a. The electric drill has a chuck very similar to the hand drill. Turning the chuck clockwise closes the chuck and turning it counter clockwise opens the chuck. Open the chuck just enough so as to allow the smooth bar on the combination bit to fit into the opening.

b. Once the combination bit has been placed into the drill chuck it must be tightened. The tightening of the chuck is done with the aid of a chuck key. To employ the key you must first find any one of the three holes around the outside of the chuck. The part of the key that fits into the hole is the part that has about a $\frac{1}{4}$" of smooth bar and then has a collar of metal teeth. These metal teeth and grooves fit into the metal teeth and grooves on the drill chuck just below the holes. When the key and chuck are fitted together this provides gear like motion which will allow the chuck to be tightened.

c. Turn the key in a clockwise motion. This will in turn move the chuck in a clockwise motion, thus tightening the combination bit in place. Remove key from drill chuck.

d. Place the tip of the combination bit on the place that is to be drilled. Holding the drill and combination bit perpendicular to the wood, begin drilling by depressing the button on the handle.

Note: It is important to understand the concept of "feed". "Feed" is the speed at which the drill bit is fed into the wood. The softer the wood the faster the speed of the drill bit, and the faster the drill can be fed to clear the chips away. The harder the wood the slower the speed and feed of the drill. Also, the larger the diameter of the drill bit the slower the speed and feed. (4:498)

e. The depth to which the drill goes into the wood past the shank portion of the combination bit determines the countersinking and counterboring process. A little past the shank portion will countersink for the head of the screw. A great deal past the shank portion will counterbore for the head of the screw.

f. To remove the combination bit from the drill chuck turn the key counter clockwise.

Safety

1. The key should be fastened on the cord of the drill near the plug. This will keep the key handy and will prevent the user from leaving the drill plugged in when working with the drill bit and drill chuck.

2. Avoid using the lock button near the trigger of the electric drill. When this button is pushed in the trigger can be released and the drill will continue to operate. For complete safety the drill should operate only by depressing the trigger.

Painting

Lesson

1. Have student paint with a brush.
2. Have student paint with a roller.

Materials

1. One gallon of inside wall paint (washable with soap and water).
2. A 4" wall brush.
3. A 1½" trim brush.
4. A 6" roller.
5. A roller pan.
6. A stick for stirring the paint.
7. Waste paper.
8. A 3' X 3' board frame.
9. Soap and water for clean up.
10. Paint brush comb.
11. Rubber mallet.

Note: Because of the problem of providing the student with something to paint, I have found an alternative. I lay waste paper down in excess of 3' X 3' area and then place a 3' X 3' board frame over the paper. The enclosed area is painted like it was a section of wall. The paper extending beyond the wooden frame is used to lay the paint and painting material on.

Tactual Aids

A good paint brush and a poor paint brush could be provided for comparison when explaining the qualities of a good paint brush.

Questions and Answers

1. What should a person look for when purchasing a paint brush?

   a. The paint brush should be made of pure bristles or nylon for a longer life. (6:296)

   b. The paint brush should have split ends which will hold paint securely within the bristles. (6:296)

   c. The bristles should have elasticity. The buyer can test for elasticity by bending the bristles and then letting them go to see how quickly they assume the original position. If the bristles bounce back quickly the brush is said to have elasticity. (6:296)

   d. The paint brush should have bristles which taper down from the ferrule to the split ends. (6:296)

2. What size paint brushes should be purchased for the home?

   a. 4" wall brush for men. (6:296)

   b. 3" wall brush for women. (6:296)

   c. 1-1½" trim brush. (6:296)

3. Are certain types of bristles specially suited for certain types of paints?

   Yes, natural bristles are best for oil based paints, while nylon bristles are best suited for latex paints.

4. What does the term "hiding power" mean?

   Hiding power refers to the power of the paint to hide the design or color of the previous wall covering. Generally speaking, it is easier to cover previous paint if the old paint is lighter than the new paint. If not, often more than one coat will have to be applied. (6:299)

Procedure

1. Have student paint with brush.

   a. Clean surface to be painted.

   b. After surface is dry repair any surface holes with putty,

plastic wood, or other good crack filler.

c. Cover floors and nearby furniture with canvas, paper, or other protective material.

d. The paint should be thoroughly mixed. To do this the can of paint should be shaken well before opening.

e. To open a can of paint place the curved end of a paint can opener or the tip of a standard screwdriver in the first groove on the top of the paint can. Once the opener is situated in the first groove apply pressure downward on the handle, creating a lever effect. Go around the top of the can repeating the prying motion with the paint can opener or screwdriver until you can lift off the lid.

f. Once the lid is open, stir the paint until it is mixed well. To assure proper mixing, stir the paint for 15 to 20 minutes.

g. Prepare paint brush for the painting by tapping the brush hard in the palm of the hand to remove loose bristles. Another way to remove the loose bristles is to hold the handle of the paint brush between the palms of both hands and slide hands back and forth quickly. This method twirls the brush, freeing any loose bristles. This is done beforehand or the loose bristles will stick to the freshly painted surface. (1:195)

h. Hold the paint brush with the handle extending up between the thumb and index finger. The handle should rest against the index finger where the finger joins the hand. The fingers give the brush support by resting on one side of the ferrule while the thumb adds support by resting on the other side of the ferrule. (The ferrule is the metal part of the brush found between the bristles and the handle).

i. Dip the brush into the paint slowly and carefully so as not to submerge more than 1/3 of the bristles. Lightly drag both sides of the bristles over the inside rim of the paint can to remove excess paint. (1:195)

Note: The student will have to concentrate on feeling the brush entering the paint. My students have had success doing it this way so long as the brush is not overloaded with paint. When the brush becomes overloaded the weight of the brush confuses the feeling of the bristles entering the paint.

j. Paint the surface with overlapping strokes. Start in an area that has not been painted and work into an area that has been painted. By doing this it will prevent dripping and areas which are overloaded with paint.

k. Clean the paint brush as soon as possible for easiest clean up. Latex paints can be washed in soap and water; oil base paints, enamels, and varnish need to be cleaned in paint remover; and to clean shellac from brushes wood alcohol is needed. (7:144)

   1) Have the container and cleaning solution ready beforehand for a faster clean up.

   2) Take excess paint out of the brush before cleaning by painting the brush dry on newspaper.

   3) Submerge bristles in cleaning solution and work them against the bottom of the container. (Do not push hard on the bristles because they will bend and break off). Loosen the paint in the center of the brush by rubbing the bristles between the thumb and index fingers. If a thinner is used, rinse the brush in soap and water after cleaning.

   4) Dry bristles by twirling brush as described in step "g". Except, hold the brush so the bristles are down inside a can. The can will catch the spray created by the twirling action. (7:145)

l. Comb bristles out with a paint brush comb to straighten bristles and to remove any foreign particles. (7:146)

m. Store the brush by:

   1) Hanging it on a wall with bristles down.

   2) Wrapping the brush in paper and storing on its side.

   3) Hanging the brush in a cleaning solution. This is done by running a wire through the hole in the handle of the brush and attaching the wire to the top of a container which allows the bristles to hang in cleaning solution without touching the bottom of the can. This type of storage method is used for brushes that will be used often over a short period of time. (7:144)

   4) Wrapping the brush uncleaned in aluminum foil and putting it in the freezer compartment of the refrigerator. This method is used when the brush will be used for the same task within a day or two. (1:193)

n. Dab the grooves atop the paint can dry before replacing the lid. This will help the lid fit better and will also prevent the paint from splattering when pounding the lid on tight. As an extra precaution place a newspaper over the lid of the

paint can while it is being pounded down into place. The newspaper will catch any splattering paint. Use a leather or rubber mallet for pounding, taking care not to damage the lid.

o. Pick up waste papers and dispose of them.

p. Store paint and cleaning solutions in a place where they are free from extreme cold and heat, as well as out of the reach of children.

2. Have student paint with a roller.

a. Follow steps a-f under painting with a brush.

b. Pour paint into the deep end of the roller pan until it is one-quarter full.

c. Place the roller brush into the deep end of the roller pan and then roll the brush back and forth in the shallow end of the pan to distribute the paint evenly on the brush.

d. Paint a 2' X 2' to 3' X 3' area by going in one direction, overlapping strokes. Then go at right angles to the previous direction. Do not be too quick in rolling the roller brush because a fast spin on the brush will cause the paint to splatter. (1:189)

e. Use rollers for large wall areas--the smaller areas must be done with a brush.

f. Clean roller by first rolling it dry on newspapers before cleaning it with cleaning solutions. Then place the roller brush in the cleaning solution and force the paint out by grasping the roller brush and running your hand up and down. Once the cleaning is completed roll out the water by rolling the brush on a dry newspaper.

g. Clean roller pan by pouring excess paint back into the paint can. Wash pan out with cleaning solution, dry, and store.

h. Remove brush from the roller handle and store.

i. Follow steps n-p under painting with a brush for clean up procedures.

Safety

1. Remember where the paint can or roller pan is setting so as not to

accidentally trip over it.

2. Keep paints and cleaning solutions away from extreme heat or cold, as well as out of the reach of children.

3. When standing on a ladder do not overreach when painting, so as to avoid losing one's balance and falling.

4. Clean up all paint spills immediately so as to prevent unsure footing.

Pliers and Wrenches

Lesson

1. Have student use two wrenches for tightening and loosening a nut and bolt (machine bolt).

2. Have student use a screwdriver and wrench for tightening and loosening a nut and bolt (stove bolt).

3. Have student use a pair of combination pliers to cut wire.

Materials

1. Two wrenches in sizes to work on the nut and bolt samples.

2. A screwdriver to fit the stove bolt sample.

3. A pair of combination pliers (sometimes known as slip-joint pliers).

4. Machine and stove bolts.

5. Hexagon, square, and wing nuts to fit the machine and stove bolts.

6. Flat and lock washers.

7. Light weight wire.

Note: The Bennett Hand-Tool Dexterity Test is an excellent teaching tool. The test provides the student with large examples of machine and stove bolts, as well as tools for their removal and replacement.

Tactual Aids

Provide the student with large examples of machine bolts, stove bolts, carriage bolts, square nuts, hexagon nuts, flat washers, and lock washers. Also, if possible show the student as many of the different types of wrenches that are available to the teacher.

Questions and Answers

1. What is a pair of pliers designed to do?

   It is often said that a pair of pliers is the most widely misused tool in existence. Pliers are designed to hold objects and cut wire, not to act as a wrench for loosening and tightening nuts and bolts. When using pliers where a wrench should be used, it is easy to "chew up" the square edges of the nut or bolt because of the imperfect fit. If pliers must be used for a wrench, make sure it involves only light tasks.

2. What kinds of nuts and bolts are likely to be found around the home?

   a. Square and hexagon nuts - These two types are recognizable by their respective shapes. To purchase either one of these nuts specify the shape, the diameter of the hole, and the number of threads per inch. For example, you may purchase a box of square (shape), $\frac{1}{4}$" (Diameter of the hole), 20 (threads per inch) nuts.

   b. Wing nuts - Wing nuts are used where hand tightening is sufficient. To accommodate hand tightening the wing nut has two small metal wings which provide the fingers with something to grasp. Wing nuts are ordered by specifying: wing nut, the diameter of the hole, and the number of threads per inch.

   c. Machine bolts - These bolts are probably the most commonly used bolts. They are recognizable by the square and hexagon heads. Machine bolts are used in conjunction with either square or hexagon nuts. Machine bolts are purchased by specifying: head shape, length of the bolt, diameter of the bolt, and the number of threads per inch. For example, a square head, 1" long, $\frac{1}{4}$" in diameter, with 20 threads per inch.

   d. Stove bolts - These bolts resemble woodscrews except they do not come to a point. The head of the stove bolt can be either round, oval, or flat with a standard or Phillips slot in the head. A screwdriver is necessary to stabilize the bolt while a wrench of some kind tightens or loosens the nut.

   e. Carriage bolts - These bolts are designed to hold themselves stable while the nuts are turned on or off. Carriage bolts have dome shaped heads which will not allow for wrenches to grasp them. So, in order for the bolts to keep from turning they have square shanks beneath the heads which fit into a square hole.

3. What wrenches are commonly used in the home?

   a. Open end wrench - This wrench has a head which resembles in

shape the letter "U". Open end wrenches can be purchased in the following combinations:

1) With just one head.

2) With a head on each end of the tool, both being different sizes.

3) With an open end head on one end and a box head on the other end, both heads being the same size.

b. Box wrench - This wrench has an enclosed head which fits over the head of a bolt or a nut. The box wrench feels like it has two metal rings at each end.

c. Crescent wrench - This wrench is probably the most useful wrench to have around the home. It is sometimes referred to as an adjustable open end wrench, and just as the name implies it is a very versatile tool to have in the home tool cabinet.

d. Pipe wrench - This is a heavy duty wrench used mainly with plumbing hardware and pipes. Like the crescent wrench, it is adjustable so it meets a variety of needs when working with plumbing fixtures.

4. What are the purposes of flat and lock washers?

Flat washers are used underneath the head of the bolt and nut. Flat washers are used to protect the wood from being marred when fastening a nut and bolt to wood. Lock washers are used on machinery that has a tendency to vibrate. Like the flat washers, lock washers are placed underneath the head of the bolt and the nut. If the vibration of the machinery loosens the nut and bolt the lock washers will expand to keep the nut and bolt tight.

Procedure

1. Have student use two wrenches for tightening and loosening a nut and bolt (machine bolt).

a. Any combination of crescent wrenches, open end wrenches, and box wrenches can be used just as long as you have a wrench to hold the head of the bolt and a wrench to hold the nut.

b. Place a washer underneath the head of the bolt and slip the bolt through the hole.

c. Place a washer on the bolt before starting the nut.

d. Start the nut on the bolt by turning it clockwise. Turn the nut on as far as you can with your thumb and index finger.

e. When you cannot turn the nut any further that is the point where the wrenches must be employed. (In fact, the construction of the crescent and open end wrenches is copied after the turning power of the thumb and index finger).

f. Place a wrench on the head of the bolt to stabilize it. Then, place a wrench on the nut and continue to turn it clockwise. With open end wrenches you must have the exact size wrench for the nut and bolt. However, with the crescent wrench the size of the nut and bolt does not matter because the wrench can be adjusted to fit many sizes by turning the threaded cylinder beneath the jaws.

g. Turn the nut up snugly. Do not overdo the tightening lest you strip the threads of the nut and bolt, or break the bolt in two.

h. To remove the nut and bolt hold the head of the bolt with one wrench and turn the nut counter clockwise with another wrench. Loosen the nut until you can turn it off by hand.

Note: If the nut and bolt are rusted removal can be difficult. To aid you with such a task penetrating oil can be used to loosen up the rusted nut and bolt.

2. Have student use a screwdriver and wrench for tightening and loosening a nut and bolt. (Stove bolt).

   a. Stove bolts need a screwdriver for stabilization while a wrench is tightening or loosening the nut. Stove bolts can require the use of either a standard or Phillips screwdriver.

   b. Follow the steps under the first part of the lesson substituting a screwdriver wherever a wrench is recommended to hold the head of the bolt stable.

3. Have student use a pair of combination pliers to cut wire.

   a. The combination pliers have a double hole just beneath the joint to allow for adjustments in the holding capacity of the jaws. To change the holding capacity of the jaws hold the pliers where the holes are facing you. If the head of the bolt connecting the two parts of the pliers is in the left hole, then the pliers are in the position of least holding power. To increase the holding power of the pliers open the handles and with the right hand push the right handle toward the left hand. By doing this it will force

the bolt into the right hole, thus increasing the holding capacity of the jaws.

b. To cut wire with the combination pliers have the pliers in the smallest of the two positions. Open the jaws slightly and place the wire as far down in the jaws as possible. Now, close the jaws slowly while forcing both handles toward each other. This will cut the wire.

Note: Sometimes the nut on the bolt at the joint will loosen and will need to be retightened.

Safety

1. Sometimes skinned knuckles are unavoidable when trying to loosen a stubborn nut. To avoid serious injury make sure sharp or dangerous objects are not in the hand's path when the nut finally gives way. Wearing gloves can protect your hands from cuts and bruises in many instances.

2. Do not place all of your weight behind the force of loosening a nut, because a sudden release could throw you off balance and cause personal injury.

3. Keep penetrating oil out of the reach of children.

Screwdrivers

Note: This lesson should be preceded by the "Nails and Woodscrews" lesson.

Lesson

1. Have student place woodscrews in wood with the use of a standard, Phillips, and a spiral ratchet screwdriver.

2. Have student use the Quick Wedge screwdriver in conjunction with a standard screwdriver.

Materials

1. Standard blade screwdriver.

2. Phillips screwdriver.

3. Spiral ratchet screwdriver.

4. Quick Wedge screwdriver.

5. Variety of woodscrews.

6. Scrap wood predrilled for use with various screws and screwdrivers.

Questions and Answers

1. How do you find the right size screwdriver for the job?

   a. The blade of the screwdriver should be the same width as the head of the screw.

   b. The blade of the screwdriver should fill the slot in the head of the screw.

   c. Use as long of a screwdriver as possible because this will provide better leverage.

2. What happens when the screwdriver blade is too small? Too large?

If the screwdriver blade is too small for the job it will slide easily and strip the head of the screw. If the blade is too large it will extend beyond the head of the screw and mar the wood when being tightened down.

3. What is a Phillips screwdriver?

A Phillips screwdriver has a cross on the end of the blade with a point in the center of the cross. The sizes of Phillips screwdrivers are determined by the size of the point at the end of the blade. There are four point sizes: #0, #1, #2, and #3, smallest to largest respectively. Two sizes, #1 and #2 will be sufficient to meet most needs for a Phillips screwdriver around the home.

Note: Three sizes of standard blade screwdrivers should be purchased for the home: 3/16", 1/4", and 5/16".

4. What safety procedures should you employ when using screwdrivers?

a. Screwdrivers, like knives, have blades so they should not be handled carelessly, nor should they be carried with the blades pointing out.

b. Do not run with a screwdriver in hand.

c. Use a screwdriver for the job it was intended to do. Do not use it as a punch, lever, or wood chisel.

Procedure

1. Have student place woodscrews in wood with the use of a regular and Phillips screwdriver.

a. Start the screw with the fingers making sure the screw is straight.

b. Place the blade of the screwdriver in the slot in the head of the screw.

c. Hold the screwdriver so the blade rests securely in the slot.

d. With the screwdriver handle in the palm of the turning hand, turn the screwdriver in a clockwise motion to put the screw into the wood. With the free hand apply pressure to the top of the handle for stability.

e. To remove the screw, turn the screwdriver counter clockwise.

2. Have student place woodscrews in wood with the use of a spiral ratchet screwdriver.

   a. The ratchet screwdriver has three functions:
      1) When the button on the shaft is pushed all the way down toward the screwdriver blade it will turn clockwise. (The shaft is found between the spiral threads and the handle). This clockwise motion is used to place the screw into the wood.
      2) When the button is pushed all the way up towards the handle the screwdriver blade will turn counter clockwise. A counter clockwise motion is used to remove the screw.
      3) When the button is midway between the two positions described above the spiral ratchet screwdriver acts as a regular screwdriver.

   b. Push the button on the shaft down towards the blade as far as it will go.

   c. Put the blade of the screwdriver in the slot in the head of the screw. Hold the screwdriver perpendicular to the head of the screw.

   d. Holding the ratchet at the handle, push the handle toward the blade. Do not hold the screwdriver by the threaded part of the shaft because you will pinch your hand.

   e. When the screw is tight you will be unable to push the handle towards the blade.

   f. To remove the screw push the button on the shaft up towards the handle as far as it will go. Once you have set the button in the proper position repeat the motion that was used to tighten the screw.

   g. If the threads cannot be felt then the ratchet is in the locked position. To unlock the ratchet the threaded ring just below the button on the shaft must be turned counter clockwise. Caution: Make sure no one is standing in front of you when you release the ratchet because the blade will "pop out" quickly.

   h. The spiral ratchet screwdriver usually comes with three different size screwdriver blades. To remove a screwdriver blade rest the handle against your hip and pull back the chuck toward the handle as far as it will go. (The chuck is found just below the blade). This will release the screwdriver blade. To place another blade in the ratchet screwdriver pull back on the chuck as described above and slip the shaft of the blade in the opening in the end.

3. Have student use the Quick Wedge screwdriver in conjunction with a standard screwdriver.

   a. To start a woodscrew:

      1) Place the blade of the Quick Wedge screwdriver into the slot in the head of the screw. With the hand holding the handle, push the plastic collar at the bottom of the handle toward the screwdriver blade. This will expand the blade to securely hold the screw in place.
      2) Locate the hole with one hand and start the screw with the Quick Wedge and screw in the other hand.
      3) Once the screw has been started, release the screw from the Quick Wedge by pulling back on the collar on the handle.
      4) Finish tightening the screw with a standard screwdriver.

   b. To loosen a woodscrew:

      1) The initial loosening is accomplished with the counter clockwise turning of a standard screwdriver.
      2) Place the blade of the Quick Wedge in the slot in the head of the screw. Then push the collar on the handle toward the blade to fasten the screwdriver and screw together.
      3) Finish loosening the screw with the Quick Wedge. Once the screw has been removed from the wood release the screw from the blade by pulling back on the collar on the handle.

Safety

1. Screwdrivers, like knives, have blades so they should not be handled carelessly, nor should they be carried with the blades out.

2. Do not run with a screwdriver in hand.

3. Use a screwdriver for the job it was intended to do; not as a lever, punch, or wood chisel.

Sharpening

Lesson

1. Have the student sharpen a knife with an Ekco Sharpener.
2. Have the student sharpen a knife with a Dial-X Sharpener.
3. Have the student sharpen a knife with the use of an electric knife sharpener.
4. Have the student sharpen a knife with the use of a sharpening stone.

Materials

1. Ekco Sharpener.
2. Dial-X Sharpener.
3. Electric knife sharpener.
4. Sharpening stone.
5. 3 in 1 oil.
6. Knives (Medium size cutting knives work the best because smaller knives, like paring knives, do not provide the student with a large enough motion of drawing the knife through the sharpener).

Questions and Answers

1. What safety procedures must you keep in mind when using knives?
   a. Sharp knives are safer than dull knives. Never try to force a dull knife to cut.
   b. When cutting with a knife, cut away from the body.
   c. Whenever possible, hold the item being cut on a flat surface for stabilization. Avoid holding the item in the air when cutting it.

d. When carrying a knife hold it so the end of the blade points toward the floor.

e. When passing a knife, pass the handle first. Never yank a knife from someone's hand.

f. Wash knives separately from other utensils to avoid cutting your hand on knives hiding in dishwater. Stand knives point down in the drainer rack, and if the knife is too large lay it flat in the drainer.

2. What is meant by "hollow ground"?

A hollow ground edge is the sharpest edge that can be put on a knife blade. The hollow groundness is a concaving effect on both sides of the blade which makes for a thinner and sharper blade.

3. What is a sharpening stone?

A sharpening stone is a stone made of a tough abrasive such as silicon carbide or aluminum oxide. These abrasives are well suited for a long life of sharpening knives and tools. Oil is used in conjunction with the stone to serve as a lubricant and to keep the metal particles removed from the knife or tool from settling into the pores of the stone.

Procedure

1. Have student sharpen a knife with the use of an Ekco Sharpener.

a. The Ekco Sharpener consists of two rows of metal rings which are set close enough together that the rings from each row touch by intermeshing with one another. The groove that is made when these two rows come together provides the guide for the knife to be drawn through. Many students make the mistake of placing the knife between rings of the same row, instead of between the two rows of rings.

b. The Ekco Sharpener can be purchased with a handle to stabilize the sharpener when the knife is being drawn through it. Have the student hold onto the handle with one hand, and take up the knife with the other hand.

c. The groove can be located with the same hand that holds the knife by placing the fingers on the underside of the knife handle on the groove. After the groove has been located

slowly draw back your hand until the heel of the knife (the heel is where the blade meets the handle) is resting in the groove.

d. Draw the knife through the groove slowly while applying light to medium pressure on the blade. Lift the handle slightly when nearing the tip of the blade for this allows the curved tip to travel through the groove.

e. Repeat until knife is sharp.

Note: The knife has a tendency to drop quickly to the table top just after it has gone through the groove. Therefore, it is a good idea to have something under the sharpener that will protect the table top.

2. Have student sharpen a knife with a Dial-X Sharpener.

a. Have the student turn the dial counter clockwise and check the following settings that appear in the 12 O'clock position: the V-shaped single slot for hollow ground and serrated edge knives, the double slot for regular knives, and the square shaped single slot for scissors.

b. Select the setting for the type of tool that will be sharpened and place the sharpener on a flat surface. When sharpening hold the sharpener to one side of the slot with a firm grasp.

c. Turn the Dial-X Sharpener around so the dial is pointing away from you.

d. Place the heel of the knife in the slot and draw the knife through the slot slowly while applying medium pressure. With hollow ground and serrated edge knives apply light pressure. Applying light pressure will keep the thin hollow ground blade from breaking and the serrated edge knife from jumping out of the slot.

e. When sharpening scissors, open the scissors up and place the part of the blade that is closest to the joint in the slot for scissors. This slot is large so hold the blade of the scissor against the side of the slot at the same angle as the slot. Do each of the two blades in the same manner, making sure to draw them through the slot the same number of times. In other words, If one blade was drawn through the slot five times, the other blade should be drawn through five times.

3. Have the student sharpen a knife with the use of an electric

knife sharpener.

a. Most electric knife sharpeners are found on electric can openers. The sharpening wheels on this type of sharpener are usually in the back of the can opener. The electric knife sharpener runs off the same motor as the can opener, so the switch that turns on the can opener turns on the sharpener. Locate the groove on the electric knife sharpener that accommodates the knife.

b. Turn on the can opener and place the heel of the knife into the groove.

c. Draw the knife through the groove lifting the handle slightly when the knife is almost completely through. This will sharpen the tip end of the knife.

d. Repeat the process until the knife is sharp.

4. Have student sharpen a knife with the use of a sharpening stone.

a. Place the sharpening stone on a flat surface with some old papers or rags under it.

b. Lubricate the stone well with 3 in 1 oil.

c. Place the knife at one edge of the stone with the cutting edge pointing towards the rest of the stone.

d. Start with the blade laying flat on the stone. Then raise the non-cutting edge of the blade slightly and work the knife in a circular motion toward the rest of the stone. Make sure you are covering the entire length of the blade as you work towards the other end of the stone.

e. Turn the blade over and repeat the process.

f. When the knife is sharp, clean the stone by wiping it with a clean rag to remove the metal particles removed from the knife. Store stone in a container of oil to protect it from any metal residue or dust from settling into the pores.

Safety

1. Sharp knives are safer than dull knives. Never try to force a dull knife to cut.

2. When cutting with a knife cut away from the body.

3. Whenever possible, hold the item being cut on a flat surface for stabilization. Avoid holding the item in the air when cutting it.

4. When carrying a knife hold it so the end of the blade points toward the floor.

5. When passing a knife, pass the handle first. Never yank a knife from someone's hand.

Note: I usually have the student practice walking with a knife as well as practice handing a knife to me.

6. Wash knives separately from other utensils to avoid cutting your hand on knives hidden by the dishwater. Stand knives point down in the drainer rack, and if the knife is too large lay it flat in the drainer.

Wiring a Plug and Lamp Socket

Lesson

1. Have student wire a push-pull plug.
2. Have student wire a lamp socket.

Materials

1. Lamp socket.
2. Push-pull plug (to fit #18 parallel cord).
3. 18/2 wire (#18 wire with a parallel cord) 2' long.
4. Knife (of the paring variety).
5. Light bulb.
6. Small standard screwdriver.

Tactual Aids

1. A lamp socket and plug already wired to show as an example.
2. A push-pull plug divided in half so the student can feel the wire groove and the prong contacts.

Questions and Answers

1. Why is it important to have all plugs kept in proper working order?

   Plugs and wiring must be kept in proper working order or else they present a shock and fire hazard. Also, bad cords can cause short circuiting which will lead to blown fuses.

2. Where do cords most likely begin to show wear and tear?

   Cords most often show wear at the point where they enter the plug and where they enter the appliance. The cord wears near the plug because a majority of the handling is done at this point.

The cord will also wear at the point it enters a heating appliance because the intense heat weakens the cord.

3. What is meant by male and female plugs?

A male plug is a plug which has metal prongs protruding from the face. A female plug has holes in the face to accommodate the prongs of a male plug. An extension cord is a good example of both plugs. At one end of the extension cord the male plug is plugged into an outlet. At the other end of the extension cord the female plug receives the male plug from another electrical cord.

4. What should you do to prolong the life of an electrical cord?

   a. Electrical cords should not be pulled out of an outlet by pulling on the cord. If the cord is pulled, this will weaken the wire's connection with the plug by applying stress to the wire around the terminal screws. Always hold onto the plug when removing an electrical cord from an outlet.

   b. Electrical cords should not be placed under carpets or in areas with excessive foot travel.

   c. Appliances should not be picked up or carried by the cord.

   d. Electrical cords in close proximity with plumbing present a very serious shock hazard.

Procedure

1. Have student wire a push-pull plug.

   a. Taking a knife, cut the end of the electrical cord so the end is even. Do not strip the wire.

   b. Holding the push-pull plug with the prongs down, push the wire up through the hole in the side.

   c. Push the wire until it extends about 2" above the hole in the top of the plug.

   d. Bend the wire that extends from the hole in the top of the plug back down. Push the wire through the adjacent hole in top of the plug as far as it will go.

   e. To remove the slack in the wire at the top of the plug, pull on the cord extending from the side.

2. Have student wire a lamp socket.

   a. Disassemble lamp socket by finding where "press" is stamped into the metal. The student can feel this area if he investigates the area around by the switches. Once the area is found it must be depressed by the thumb of one hand while the other hand is pulling on the metal cap just below the switches.

   b. The lamp socket consists of four parts: cap, metal shield, insulation shield, and socket. The metal shield and insulation shield should be stood up on end to prevent them from rolling around.

   c. String the end of the wire opposite the plug through the hole in the cap. Make sure that the "bowl" of the cap is facing upward toward the end of the wire.

   d. Separate the wire into two separate strands by taking the knife and cutting along the groove in the center of the wire. Separate the wire an 1½" from the end.

   e. Taking the knife, strip ½" of insulation from each of the two strands. Do this by cutting the insulation all around the wire. Then hold the cut over the edge of the knife and bend the ½" of wire down along the side of the blade with the thumb of the hand holding the knife. With the other hand hold the rest of the wire to keep it from moving. Exert force on the knife toward the end of the wire. (Make sure the knife is being pulled away from the body, not towards it). This will remove the rubber insulation covering.

   f. Repeat "e" with other wire.

   g. Take the metal strands at the end of each wire and turn them clockwise. This will mold the strand into a single wire so it is easier to handle. Do not turn the two wires together, just the tiny metal strands of each wire should be turned into a single strand of wire.

   h. Loosen the terminal screws on the socket as far as they will go with a screwdriver. The screws are made so they will not fall out.

   i. Place one of the wires under the head of a screw at the point where the insulation and the bare wire meet. Wrap the bare wire around the screw clockwise. Wrapping the wire clockwise will hold the wire in place because it is wrapped in the direction that the screw will turn when being tightened down.

   j. Tighten down the screw with the screwdriver.

k. Repeat steps "i" and "j" with the other wire and terminal screw.

l. Reassemble the lamp socket by first slipping the insulation shield over the socket. There are two slits in the insulation shield that slide over the two switches that extend from the socket. Then slide the metal shield over the insulation shield and socket in the same manner the insulation shield was slid on. Finally, snap the cap and metal shield together by pressing them toward one another.

m. Screw light bulb in the lamp socket and test it for proper wiring.

Note: I find that of the lamp sockets and plugs that fail to work, the fault lies with the plug. Usually the end of the wire that fits into the plug has to be removed and recut to complete the circuit.

Safety

1. When stripping the insulation from the wire, make sure the force of the knife is not towards the body.

2. Take care of electrical cords found in the home by keeping them from under carpets, not pulling on them to unplug an appliance, and repairing them when necessary.

3. Keep electrical cords away from plumbing fixtures and pipes.

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THE HOME MECHANICS SHOPPER

Dial-X Sharpeners can be purchased at Federals, Grants, Woolworths, or at many other large department stores. If one cannot be found, order one from: Western Select, 230 E. Pomona Avenue, Monrovia, California 91016.

To purchase a Perkin's braille ruler write for a price list for Appliances and Mathematical Aids, Games and Braille Paper from: Howe Press of Perkins School for the Blind, Watertown, Mass. 02172.

For many useful items to the home mechanic order the Aids and Appliances Catalog from: American Foundation for the Blind, Inc., 15 West 16th Street, New York, New York 10011.

Lumber yards are excellent places for buying hand tools, nails, woodscrews, home remodeling supplies, roofing, and, of course, all types of lumber.

Sears stores have excellent hardware departments which carry everything the home mechanic needs. Sears' tools and products are items of excellent quality.

Most large department stores have hardware departments which are well equipped to meet most of the home mechanic's needs. Let the buyer beware, however, because quality differs greatly from store to store.

Finally, when replacing specific plumbing and electrical items it will be necessary to buy the replacements at a store which specializes in such items.

THE HOME MECHANIC'S TOOL CABINET

Brad pusher

Braille ruler (Perkins)

Claw hammer (13 oz.)

Combination bits

Combination pliers

Crescent wrenches (2)

Crosscut saw with eight teeth per inch

[illegible]-X Sharpener

Drill index with bits ranging from 1/16" to 1/4"

Ekco Sharpener

Electric drill, 3/8"

Fire extinguisher (5 lb. ABC)

Hacksaw with saw blade having 18 teeth per inch

Hand drill

Leather mallet

Masonry bits

Paint brushes (4" wall brush, 3" wall brush, and 1½" trim brush)

Paint brush comb

Phillips screwdrivers (#1 and #2)

Plumber's friend

Plumber's snake

Pipe wrench

Putty knife

Quick Wedge screwdrivers

Roller brush and handle

Roller pan

Scratch awl

Sharpening stone

Spade bits (3/8", 1/2", 5/8", 3/4" and 1")

Standard blade screwdrivers (3/16", 1/4" and 5/16")

Try square

Utility knife

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This is an excellent book for home mechanics information. This loose leaf text has some very useful chapters such as: Chapter #1, Hand Tools; Chapter #4, Fastening Techniques; Chapter #6, Plumbing and Wiring; and Chapter #8, Windows and Doors. Also, the illustrations in this book are excellent.

Griffin, A. So You Want to Buy a Mobile Home. Chicago: Regnery Co., 1970.

Hayward, C. The Complete Handyman. New York: Drake, 1969.

This book contains chapters on decorating, floors, doors, nailing, and sharpening. The book is rather detailed and does not appear simply written.

Schultz, Morton J. How To Fix It. New York: McGraw Hill, 1971

Ward, Kay. The Feminine Fix-It Handbook. New York: Grosset & Dunlap, Inc., 1972.

Woodin, J. C., and Hayes, L. E. Home and Building Maintenance. Bloomington, Ill.: McKnight & McKnight, 1969.

This book is written in short, easy to understand chapters. A variety of subjects are covered which include many fix-it and clean-it jobs around the house, as well as explanations of the why and how of plumbing and electricity.

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